AUTOMOTIVE INDUSTRIES

PASSENGER CARS • TRUCKS • BUSES • AIRCRAFT • TRACTORS • ENGINES • BODIES • TRAILERS • ROAD MACHINERY • FARM MACHINERY
PARTS AND COMPONENTS • ACCESSORIES • PRODUCTION EQUIPMENT • SERVICE EQUIPMENT • MAINTENANCE EQUIPMENT
ENGINEERING • PRODUCTION • MANAGEMENT

SEPTEMBER 15, 1950

In This Issue . . .

Effects of Military Vehicle Orders

Faster Operations on Cylinder Heads

Experimental Gas Turbine Locomotives

Producing 100,000 Valve Guides a Day

Determining Drag Under Road Conditions

Complete Table of Contents, Page 3

A CHILTON PUBLICATION

who's the boss of this plant?

YOU ARE!

Yes — it's quite an organization you've got working for you here at The Heald Machine Company. In fact it's one of the most modern and efficient plants in the machine tool industry. And you are the boss — in more ways than one.

This entire plant was built and organized for *your benefit*. Its unequalled facilities for the production of precision finishing machines are at *your service*. Our staff of skilled engineers is always ready to help you on *your production problems*.

And when we brought out the complete new line of Heald machines, it was you who wrote the specifications. For every detail — from base to bridge — was designed to make your production faster, easier, and far less costly than ever before.

The faster cycles, easier operation, heat-proof hydraulics, constant feed, higher round-the-clock precision, reduced maintenance — these and many other new Heald features are just what *you ordered!* That's why a new Heald machine can do so much to help you speed up production and cut the manufacturing cost of your precision finished parts.

Remember — when it comes to precision finishing, it pays to come to Heald.

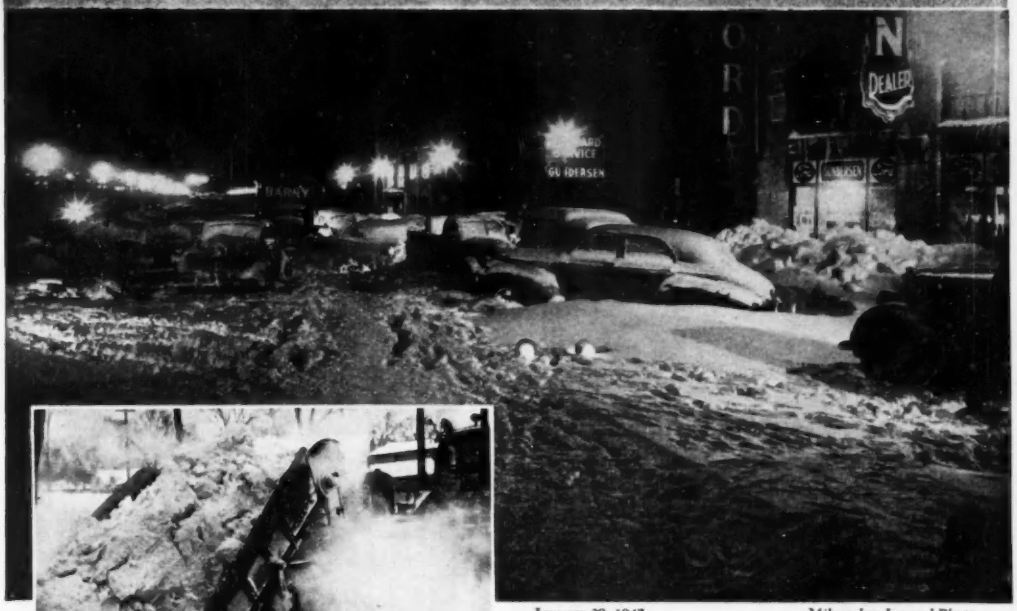
THE HEALD MACHINE COMPANY

WORCESTER 6, MASSACHUSETTS

HEALD

Branch Offices: Chicago • Cleveland • Dayton • Detroit • Indianapolis • Lansing • New York

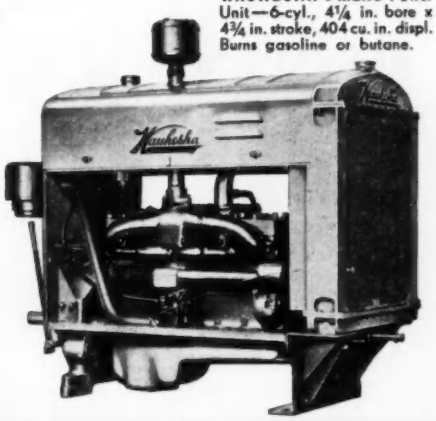
REMEMBER THIS?



January 29, 1947 — *Milwaukee Journal Photo*

Waukesha-powered *Pitcher* Snow Mover pitches snow completely off highway; or picks it up off city streets and loads it into trucks.

WAUKESHA 6-MZAU Power Unit—6-cyl., 4¼ in. bore x 4¾ in. stroke, 404 cu. in. displ. Burns gasoline or butane.



● When, and not if, it snows—get those streets and highways open quick . . . and keep 'em open . . .

Look at the way this Waukesha-powered *Pitcher* Snow Mover is doing it—scooping up heavy, ice-crusted snow from head-high drifts . . . pitching it clear off the highway, 40 to 100 feet away into the fields, on either side. On city streets it picks up the snow, loads it at high-speed into trucks alongside.

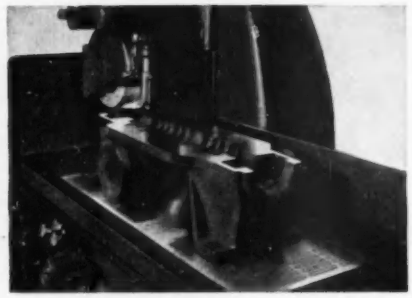
A chain-driven, endless belt elevator puts the snow into the *Pitcher's* powerful rotating fan that does the pitching. Or, by closing the pitching vent, snow is speedily forced through the elevated loading chute into hauling trucks. And the Waukesha 6-MZAU unit puts plenty of power behind both rotator and elevator.

It's a *smooth* power plant . . . with all Waukesha modern design features, including the special design manifold and Controlled Turbulence combustion chamber. Waukesha low cost operation and maintenance features, too—with Waukesha proved reliability. Send for Bulletin 1270.

WAUKESHA MOTOR COMPANY, WAUKESHA, WIS.
NEW YORK • TULSA • LOS ANGELES

WAUKESHA ENGINES

WHERE THERE IS A FLAT SURFACE TO GRIND THERE'S A MATTISON TO GRIND IT.



40 hours before — now 4 hours. Pump case ground on Mattison Horizontal Spindle Precision Surface Grinder.

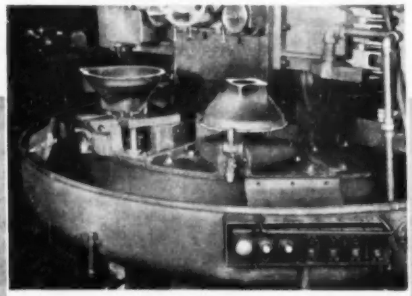
700 connecting rods per hour, using 40 station fixture to finish grind crank and wrist pin end of assembled rod with Mattison No. 72 Grinder.

With the addition of the production grinding machinery formerly made by the Hanchett Manufacturing Company, Mattison is now in a position to work with you on all your surface, face and disc grinding problems. These machines are made in various types to handle a wide range of work. Experienced engineers are available to give you best production efficiency, finish and tolerances, with Mattison machines.

For any flat grinding ask for our recommendations on the proper method and machine for your job. No obligation, of course.

For catalogs on any of the types shown or if you would like a copy of the general bulletin, let us know and we'll gladly send them to you.

Grinding Cast-Iron Cams — 5" diameter, 1⅛" thick — stock removal, each side .030". Production 120 surfaces per hour on Mattison (Hanchett Type) Rotary Surface Grinder.



200 Transmission Case surfaces ground per hour on Mattison (Hanchett Type) Rotary Automatic Grinder. A special 8-station mechanical fixture permits one operator to grind each end of this large 35 lb. casting, flat and parallel. Stock removal .050".

320 surfaces oil cast iron compression heads per hour, removing 1/32" stock with Mattison No. 84 Rotary Surface Grinder.

MATTISON MACHINE WORKS

ROCKFORD · ILLINOIS

AUTOMOTIVE INDUSTRIES

Published Semi-Monthly

Sept. 15, 1950 Vol. 103, No. 6

Contents

High Spots of This Issue 15
News of the Automotive Industries 17
Men in the News 25
Calendar of Coming Events 25
Big Broaching Machine Boosts Cylinder Head Output. By Joseph Geschelin 32
Thousands of Suppliers Needed for Military Vehicle Orders. By Leonard Westrate 34
Making More Than 100,000 Valve Guide Bushings per Day. By Herbert Chase 38
British Experimenting with Gas Turbine Locomotives. By W. F. Bradley 41
All-Electric Window Lift a New Chrysler Development 42
Determining Drag of an Automobile Under Actual Road Conditions. By Sighard F. Hoerner 43
Engine Design and Its Relation to Fuels and Lubricants. By V. G. Raviolo 44
Non-Jamming, Overrunning Ball Bearing Screw and Nut 46
Increasing Popularity of Scooters in Italy. By P. M. Heldt 47
Airbriefs 48
Vacuum Controlled Distributor for Heavy Duty Engines 50
Fast, Accurate Boring Operations on Cadillac Cylinder Heads 52
Publications Available 54
New Production and Plant Equipment 56
New Products 67
New Aircraft Products 82
New Type Stainless Powder 94
1951 Packard Ultramatic Improvements 102
Compression Ratio, Octane Demand, and Lubrication. By R. J. S. Pigott 104
Business in Brief 128
Advertisers' Index 162

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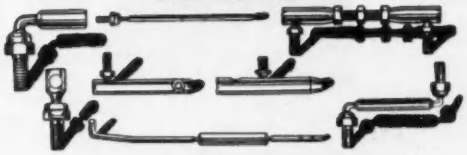
AUTOMOTIVE INDUSTRIES is a consolidation of The Automobile (weekly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918

AUTOMOTIVE INDUSTRIES, Vol. 103, No. 6. Published semi-monthly by Chilton Co., Chestnut & 56th Sts., Phila. 39. Entered as Second Class Matter October 1, 1925, at the Post Office at Philadelphia, Pa.; Under the Act of Congress of March 3, 1879. In case of Non-Delivery Return Postage Guaranteed. Subscription price: United States, Mexico, United States Possessions, and all Latin-American countries, 1 year $2.00, 2 years $3.00. Canadian and Foreign $5.00 per year; single copies, 25 cents, except Statistical Issue (Mar. 15th), $1.00.

TOUREK

BALL JOINTS, PIPE PLUGS AND QUALITY SCREW MACHINE PRODUCTS

BALL JOINTS



Tourek's quality Ball Joints meet exacting requirements. Simplified design, improved performance, and lower costs result from specifying Tourek Ball Joints... the only recognized standard. Large stocks assure prompt delivery.

PIPE PLUGS

Tourek's precision countersunk steel pipe plugs are accurate, high strength, and economical—resulting in the highest quality at costs which are competitive to old style plugs.

Stock sizes, available with National Pipe or Dry-Seal threads are: ¼", ⅜", ½", ¾" and 1". Also available on special order in alloy steels, aluminum or brass in sizes up to 2⅝" diameter.

SCREW MACHINE PRODUCTS

Modern high-speed single and 6-spindle automatics—together with complete secondary equipment, including grinding and brazing—plus 30 years' experience, assure you "The Best in Quality Screw Machine Products."

Your requirements, up to 2⅝", are made with utmost precision, and with promptest delivery assurances.

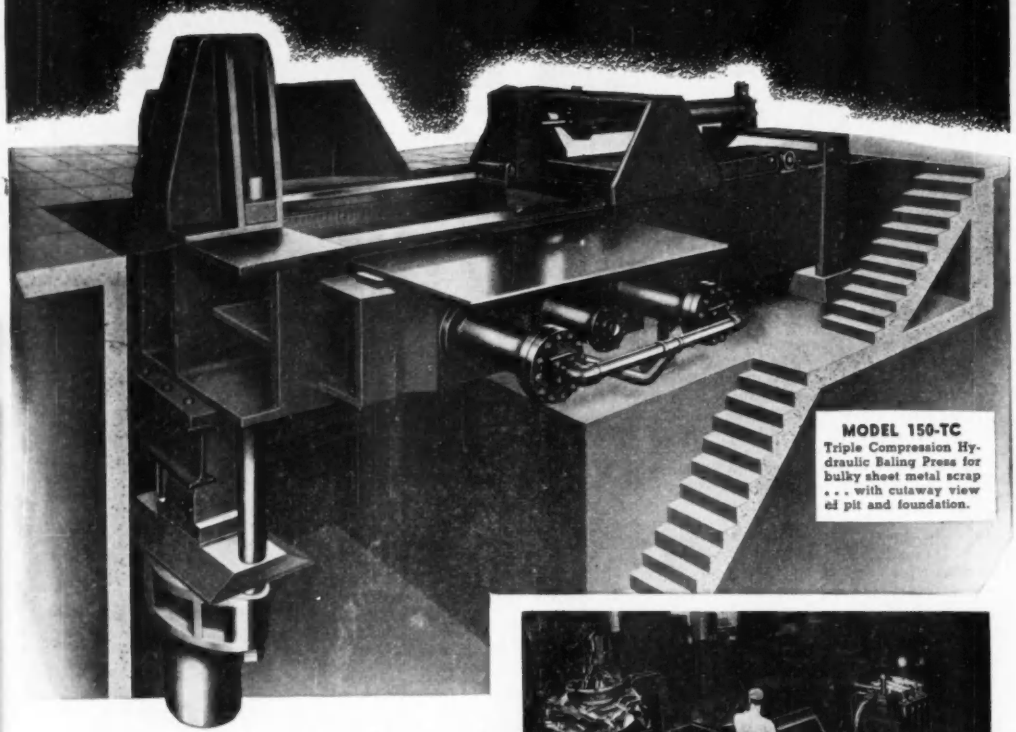
LITERATURE—Comprehensive data on any or all Tourek products sent promptly upon request. Write for yours now. J. J. TOUREK MFG. CO., 4701 West 16th St., Chicago 50, Illinois.

TOUREK

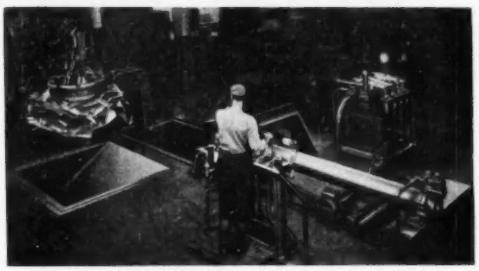
"THE BEST IN QUALITY SCREW MACHINE PRODUCTS"

ESTABLISHED IN 1920

Sheet Metal SCRAP MUST Be BALED!



MODEL 150-TC
Triple Compression Hydraulic Baling Press for bulky sheet metal scrap . . . with cutaway view of pit and foundation.



Operating view of a G-H Triple Compression Baler which has served a large Eastern metal working plant profitably for many years.

Light gauge sheet metal "scrap" . . . such as industrial stampings and clippings . . . is an increasingly important factor in the production of new metal, and in the conservation of natural resources. For greatest economy and most effective utilization, it must be compressed into compact BALES of proper size and density. As such, it brings top market prices from mills, smelters, foundries.

The Hydraulic, Scrap-Metal Baling Press is necessary, profit-producing equipment in any well ordered plant where this type of scrap metal is generated in sufficient volume. Galland-Henning builds powerful, efficient hydraulic balers in a range of sizes and capacities to meet every industrial need. For Experienced Counsel on Profitable Baling of your Sheet Metal Scrap, write —

GALLAND-HENNING MFG. CO.
2747 SOUTH 31ST STREET • MILWAUKEE 46, WISCONSIN

GALLAND-HENNING

SCRAP METAL BALING PRESSES

A 5589-1P

This compact, handy and inexpensive vertical spindle grinder handles a large volume of free-hand work: castings, forgings, stampings, plastics, etc., where only a little stock removal is required. All grinding is done in a horizontal plane. This assures easier handling, more production and safer operation.

Complete with 18" diameter abrasive wheel, this grinder weighs 575 pounds. The height is 31" and the overall width, 28½". Because of its compact, rugged construction, it is easily mounted on a bench or stand of suitable height. Disc dressing is easily done by quick removal of a section of the guard rail to permit the dresser arm to swing across the face of the abrasive.

Keep your production costs down by drawing on Besly's more than 50 years accumulated experience in finding the best answers to all types of grinding problems. Write for Grinder Bulletin No. 318-18.

DIMENSIONS AND SPECIFICATIONS

DIA. OF STEEL DISC WHEEL	18"
ABRASIVE SIZE	18" dia., 1" or 2" thick
END THRUST ON CENTER OF SPINDLE	2000 lbs.
MOTOR	5 h.p., 1160 r.p.m., 220/440 volt, 3 phase, 60 cycle, totally enclosed, fan cooled, ball bearing, Fairbanks-Morse Axial Air Gap
DRESSER	Radial arm with ball bearing dresser cutters
WHEEL GUARD RING	Removable
EXHAUST PIPE OUTLET	4½" inside dia.
HEIGHT	31" to top of dresser arm 17½" to top of tub
WIDTH	28½" overall with dresser attachments 23½" dia. tub
APPROX. WEIGHT COMPLETE WITH ABRASIVE	575 lbs.
APPROX. WEIGHT CRATED	675 lbs.
OPTIONAL EQUIPMENT	Crossarm, pedestal, motor driven coolant pump, tank, and piping for wet grinding

BESLY-TITAN WHEELS

Just out — the new Besly-Titan booklet of abrasive wheels and discs — a valuable source of information on modern grinding wheels — up-to-date — authoritative. Includes full data on Besly-Titan Steelbacs that cut "down time". Write for your copy today!

BESLY

TAPS—the world's most accurate tap.

TWIST DRILLS AND REAMERS—Complete line for every need.

BESLY-TITAN ABRASIVE WHEELS AND DISCS—Individually formulated for your job.

GRINDERS that reduce costs on every type of surface grinding.

CHARLES H. BESLY & COMPANY

118 N. Clinton Street, Chicago 6, Illinois • Factory: Beloit, Wisconsin

THIS BUNDYWELD oil line, completely fabricated and shipped ready for installation, is an example of the detailed attention paid by Bundy engineers to the exacting specifications of a particular automotive application.

What's your special need for Bundyweld?

Every car, truck, bus or tractor produced today has a need for rugged Bundyweld Tubing somewhere in important fuel, oil, hydraulic brake line or other automotive applications.

A vital need, considering Bundy's special performance, safety and durability. It's the only tubing double-walled from a single strip, a patented construction that makes it stronger, lighter, more leakproof.

It's ductile, too—can be bent easily, quickly and to your *exact* specifications with no worry of buckling or weakening. All the jolts and strains a car can give a tubing won't damage Bundyweld one bit. Its sturdy walls are highly resistant to vibration fatigue, and the complete copper bond assures pressure-proof performance always.

What can be done *with* Bundyweld is as amazing as what Bundyweld can do. The most intricate bending problem or the most complicated fabrication is just the meat for Bundy engineers. You say good-bye to production headaches with Bundyweld and Bundy experts on the job.

Find out for yourself, today, what Bundyweld can do to improve your product. Contact a listed distributor, or write: ***Bundy Tubing Company, Detroit 14, Michigan.***

Bundyweld® Tubing

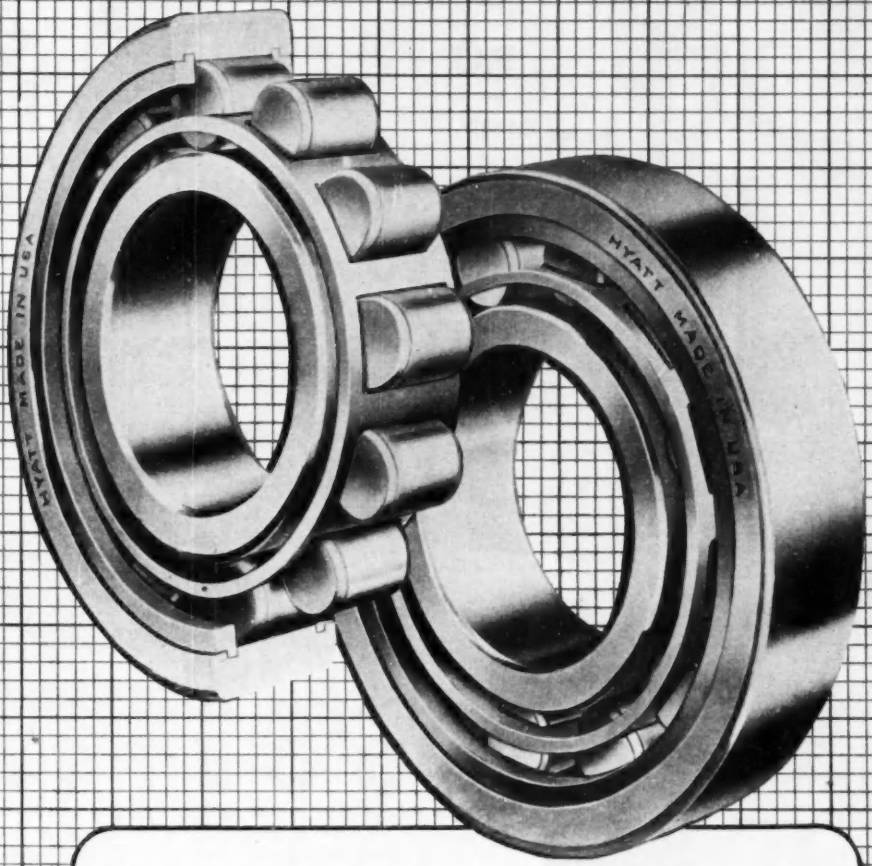
DOUBLE-WALLED FROM A SINGLE STRIP

WHY BUNDYWELD IS BETTER TUBING

Bundyweld starts as a single strip of basic metal, coated with a bonding metal. Then it's . . . continuously rolled twice around laterally into a tube of uniform thickness, and passed through a furnace. Bonding metal fuses with basic metal, presto— **Bundyweld** . . . double-walled and brazed through 360° of wall contact.

NOTE the exclusive patented Bundyweld beveled edge, which affords a smoother joint, absence of bead and less chance for any leakage.

Bundy Tubing Distributors and Representatives: *Cambridge 42, Mass.:* Austin-Hastings Co., Inc., 226 Binney St. • *Chattanooga 2, Tenn.:* Peirson-Deakins Co., 823-824 Chattanooga Bank Bldg. • *Chicago 32, Ill.:* Lapham-Hickey Co., 3333 W. 47th Place • *Elizabeth, New Jersey:* A. B. Murray Co., Inc., Post Office Box 476 • *Philadelphia 3, Penn.:* Rutan & Co., 404 Architects Bldg. • *San Francisco 10, Calif.:* Pacific Metals Co., Ltd., 3100 19th St. • *Seattle 4, Wash.:* Eagle Metals Co., 3628 E. Marginal Way *Toronto 5, Ontario, Canada:* Alloy Metal Sales, Ltd., 881 Bay St. • **Bundyweld nickel and Monel tubing is sold by distributors of nickel and nickel alloys in principal cities.**



The challenge that keeps Hyatt ahead

Although Hyatt has been supplying roller bearings to the automotive industry since 1892, Hyatt has never rested on its early laurels.

Hyatt has met the challenge of the country's most progressive industry and year after year Hyatt experience, research, testing, and quality production have measured up to the exacting demands of the builders of cars, trucks and buses.

Here at Hyatt are more than four thousand workers doing one thing well—making Hyatt Roller Bearings so good that they are still good after the machines they were built into are out-dated. Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.

HYATT ROLLER BEARINGS

with Miller

Fluid Pressure BOOSTERS

From ordinary plant air line pressure, Miller Boosters produce hydraulic pressures (from 200 to 10,000 psi) for driving one or more hydraulic work cylinders simultaneously at from 30 to 450 strokes per minute. Ordinarily, the booster operates one stroke for each stroke of the operated work cylinders.

Used in place of conventional type hydraulic pumps, Miller Boosters save space and weight, permit convenient portability and are easier and less costly to install, operate, and maintain. Also, they hold pressure *indefinitely —without the motion and heat generation of ordinary pump circuits.*

Used in place of air cylinders, the booster driven hydraulic work cylinder, which can do the work of an air cylinder ten times as large and heavy, saves space and weight at point of application of cylinder thrust—since the booster itself can be mounted separately—away from the hydraulic work cylinder—and either on or off the equipment or machine.

In many installations, the popular Miller Dual Pressure "Air Miser" Booster *saves up to 95% of the air* normally consumed by direct-driven air cylinders.

A wide selection of sizes, pressure ratios and mounting styles are available for the first time at low cost on a normal delivery schedule because Miller Boosters are built up from stock Miller standard cylinder parts to eliminate costly designs, patterns and castings.

Full Details In Miller Bulletin B-200 Sent FREE On Request

OTHER MILLER PRODUCTS INCLUDE: AIR CYLINDERS, 1½" to 20" BORES, 200 PSI OPERATION; LOW PRESSURE HYDRAULIC CYLINDERS, 1½" TO 6" BORES FOR 500 PSI OPERATION, 8" TO 14" BORES FOR 250 PSI; HIGH PRESSURE HYDRAULIC CYLINDERS, 1½" TO 12" BORES, 2000-3000 PSI OPERATION. ALL MOUNTING STYLES AVAILABLE.

Miller

MILLER MOTOR COMPANY

4031-33 N. Kedzie Avenue, Chicago 18, Illinois

AIR AND HYDRAULIC CYLINDERS · ACCUMULATORS · COUNTERBALANCE CYLINDERS · BOOSTERS · AIR HOISTS

CLEVELAND — PITTSBURGH — PHILADELPHIA — DETROIT — YOUNGSTOWN — BOSTON
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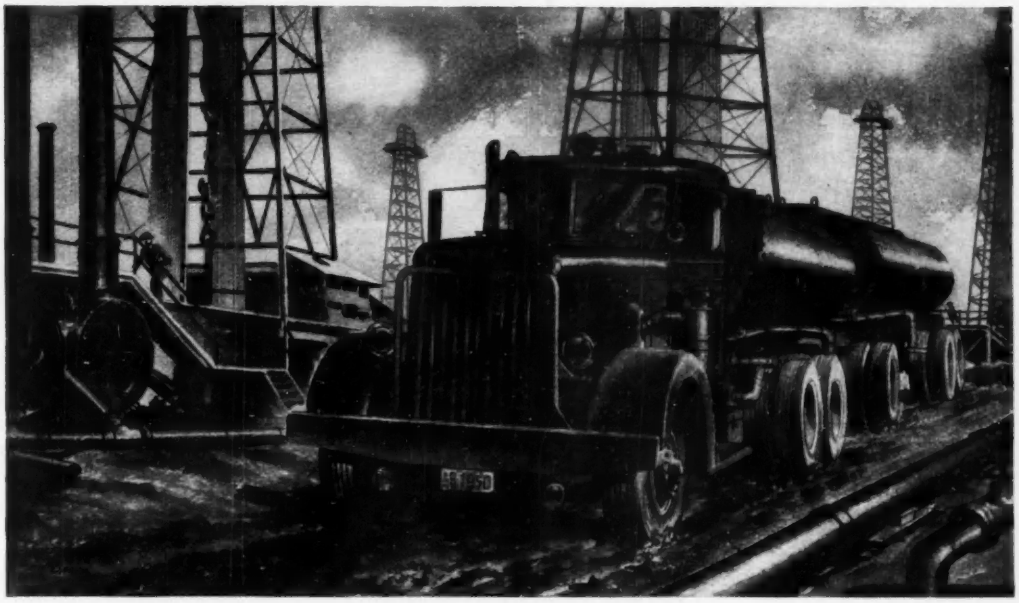
ST. LOUIS and OTHER AREAS.

Sales and Service from coast to coast

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A-7-80

WHEN THE JOB IS *Tough*



ROSS BRINGS EASE . . . AND ECONOMY

Ross

Cam & Lever **STEERING**

OIL—vital sinew of peace and war—plays an ever more important role in America's progress. With a total investment of over $30 billion, the oil industry depends on heavy-duty "tankers" that operate under difficult conditions of road and terrain—*where the tough job of steering becomes easier and safer when the steering is ROSS.*

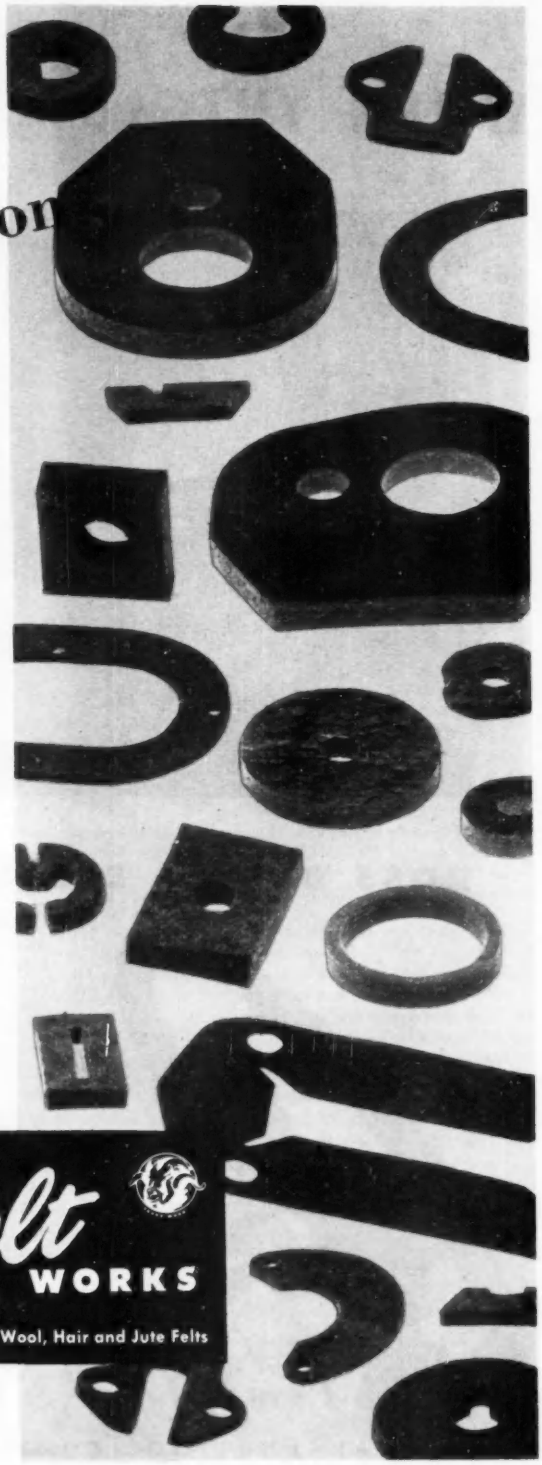
The Ross policy of incorporating advancements in design as they are proved by exhaustive tests has resulted in many recent improvements. Current Ross models have:

(1) ***Increased mechanical reduction*** . . . (2) ***More compactness*** . . . (3) ***Reduction in weight*** . . . (4) ***Greater arm angular-travel*** . . . (5) ***Improved metallurgy*** . . . (6) ***Increased efficiency.***

Throughout 43 years of leadership in this industry, Ross gears have been distinguished for long life, simplicity of adjustment and maintenance of long-recognized qualities of safety, stability and performance. We invite discussion of any steering problem.

ROSS GEAR AND TOOL COMPANY • LAFAYETTE, INDIANA

for top precision



Production to close tolerances mostly applies to metal working. But the technique of Western Felt production and processing has built an enviable reputation for engineering precision.

Chemical specifications must be perfectly met — parts from wool softness to rock hardness are cut to close tolerances. As an extremely versatile material Western Felts are resilient, flexible, compressible. They resist oil, water, heat age — do not ravel, fray or lose shape. New uses found daily. It pays to depend on Western Felt.

Check Possible Uses for Your Product

- Excluding dirt, grit, dust • Retaining lubricants
- Thermostatic insulation • Isolating vibration
- Cushioning shock • Padding, packing, seals
- Air and liquid filters • Gaskets, channels, etc.
- Grinding, polishing, etc. • Weight reduction
- Instrument mounts

WESTERN Felt WORKS

4035-4117 Ogden Ave., Chicago 23, Illinois

Branch Offices in Principal Cities

Largest Independent Manufacturers and Cutters of Wool, Hair and Jute Felts

Acadia Synthetic Products Division, WESTERN FELT WORKS, Processors of Synthetic Rubbers — Sheets, Extrusions, Molded Parts.

SEVEN STRONG REASONS

A better steel for the purpose in hand has always found favor with manufacturers of commercial vehicles . . . currently the trend is to N-A-X HIGH-TENSILE steel.

NAX GREAT IMPACT TOUGHNESS

NAX FINER GRAIN STRUCTURE

NAX HIGH FATIGUE RESISTANCE

NAX HIGH STRENGTH

NAX GOOD FORMABILITY

NAX HIGH CORROSION RESISTANCE

NAX EXCELLENT WELDABILITY

MAKE A TON OF SHEET STEEL GO FARTHER

Specify—

N-A-X

HIGH-TENSILE STEEL

GREAT LAKES STEEL CORPORATION

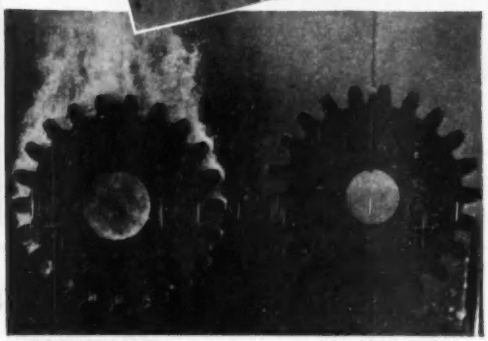
N-A-X Alloy Division, Ecorse, Detroit 29, Michigan

NATIONAL STEEL CORPORATION

LIFE EXPECTANCY UNKNOWN

ENRUP, new plastic by U. S. Rubber, outmodes present standards of endurance on many industrial applications

THE GEAR THAT LOVES WEAR! One of the many uses of Enrup plastic, is this Enrup gear which has been operating for 6 months on a heavy-duty, 36-inch lathe without showing signs of wear. Other Enrup gears have been operating for as long as a year where ordinary metal gears have failed within a few days or weeks.



NO BATH FOR A SISSY. See how the 20 per cent solution of sulphuric acid eats away the steel gear at left, while the Enrup gear is unharmed. Enrup is the plastic that outwears steel, is non-conductive, non-absorbent, easy to clean, makes no noise when in operation. It has high tensile and impact strength, is unaffected by oils.

A DESIGNER'S DELIGHT. Just a few of the many products which have been molded for leading manufacturers out of Enrup. It can be made into almost any shape or form, punched, sawed, sanded, nailed, bolted, molded and machined. Smallest item weighs as little as one-third of an ounce. The largest? There's no size limitation.

Many a product is successful today because of Enrup. This new plastic is lightweight, rugged, handsome and highly workable, permits designing and engineering economies previously thought impossible. Can your product be improved by this versatile material? Our engineers will gladly tell you, at no obligation. Write to:

A PRODUCT OF

U.S. RUBBER
SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

Wean-Hallden

LOW COST SYNCHRONIZED AUTOMATIC SHEAR LINES

THE installation of a Wean-Hallden Synchronized Automatic Shear Line assures you the most efficient shearing operation available today. The Wean-Hallden, while actually requiring *less floor space*, delivers up to *twice the production.*

Infinite variable lengths from 12-inches to 12-feet at speeds up to 200 FPM with accuracy better than commercial tolerances means faster production, reduced labor costs and minimum scrap loss for you. *Before You Buy—Investigate Wean-Hallden.*

Wean *Equipment Corporation*

CLEVELAND, OHIO

Bendix Products Division

CREATIVE ENGINEERING

GEARED TO QUANTITY PRODUCTION

75 MILLION BRAKES

PRODUCED FOR THE AUTOMOTIVE INDUSTRY

Producing 75 million brakes is a remarkable accomplishment even in these days of large numbers and mass production methods. This remarkable record is made possible because Bendix Products Division has such things as —

A quarter century of specialized experience

Recognized engineering excellence

Research that has set the pace in design development

Proved manufacturing skill and capacity

Overwhelming endorsement of the automotive industry

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High Spots of This Issue

★ Big Broaching Machine

An enormous Cincinnati horizontal surface broaching machine installed recently at Buick is greatly boosting cylinder head output for the 1950 Super engine. How this mammoth machine makes serious automatic broaching problems a thing of the past is told in the article beginning on page 32.

★ Suppliers for Military Vehicles Needed

Thousands of suppliers are needed to fill military vehicle orders under the present military defense program. The effects of this program on automobile production, plant decentralization, and contract procurement are among the interesting elements of the situation ably elaborated upon in this timely article. Page 34.

★ 100,000 Valve Guide Bushings per Day

At Ford's Highland Park plant iron permanent mold castings undergo grinding, screw machine, and boring operations. Unusual means for feeding work to the machines automatically are a feature. The processing of finished work pieces to remarkably close tolerances is here discussed. Page 38.

★ Determining Drag of an Automobile

Results of deceleration tests of a modern passenger car on the open road are presented and analyzed in this article. They indicate not only the aerodynamic drag under true conditions, but also the mechanical and the tire drag. See page 43.

★ Engine Design Problems

Extracts from two papers presented at the recent meeting of the American Petroleum Institute Lubricants Committee are published in this issue. They are of particular interest to those engaged in the automotive industries. Page 44.

★ 24 New Product Items And Other High Spots, Such As:

British experimentation with gas turbine locomotives; an all-electric window lift development of Chrysler; a non-jamming, overrunning ball bearing screw and nut; increasing popularity of scooters in Italy; and Ultramatic improvements on the 1951 Packard.

News of the Automotive Industries, Page 17
For Complete Table of Contents, See Page 3

HOARDING STEEL...

is hardest on the hoarder!

Buying steel for which you have no immediate need helps set up a vicious chain reaction. The next fellow follows your example—and the next. Supplies are soon depleted. In a week or two you may be searching in vain for a certain steel—which is lying idle in a neighboring plant!

The primary purpose of the steel warehouse is to supply the day-to-day needs of industry—not to help build up a host of private stock piles. Warehouse stocks are constantly being replenished by mill sources to balance receipts against shipments. But if everybody starts buying beyond their immediate needs the system breaks down—and everybody suffers.

The vital function of the steel warehouse was recognized in World War II. Provision was made for continuous replenishment of warehouse stocks. This recognition continues.

Hence we urge steel users to exercise judgment in placing orders. Order from warehouse for your current needs only. Our company and all the other steel-service organizations will continue to serve you to the best of our combined abilities. But our usefulness will be crippled if steel buyers themselves let the situation get out of hand. So let's work together to maintain production throughout the country.

PARTIAL LIST OF PRODUCTS — BARS • STRUCTURALS • PLATES SHEETS • TUBING — IN CARBON, ALLOY & STAINLESS QUALITIES

RYERSON STEEL

RYERSON CERTIFIED STEELS

STEEL-SERVICE PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • DETROIT • CINCINNATI • CLEVELAND PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

News of the AUTOMOTIVE INDUSTRIES

Vol. 103, No. 6 September 15, 1950

New Engine Activity Spurred by War

Automobile companies with plans well underway for new engines are reported to be stepping up their programs. One reason, of course, is the uncertainty of the international situation which might result in restriction on development and tooling if the war picture should take a turn for the worse. Chrysler has considerable tooling underway and is quite likely to bring out its V-8 engine as scheduled on the 1951 Chrysler line. It appears doubtful, however, that there will be any major engine changes on the rest of the Chrysler Corp.'s models. Another factor which may influence adoption of much higher compression engines is pending legislation dealing with an upper limit on the octane quality of fuel.

New British Sports Car Called Marauder

A British sports car with Rover engine, transmission, brakes and suspension, is just coming on the market. Called the Marauder, it is being announced by Wiks, Mackie & Co., of Birmingham, England. The compression ratio of the Rover "75" F-head engine used was increased to 7.6 to 1. The wheelbase has been reduced to 102 in.

Hudson Three-Months Net Double Year Ago

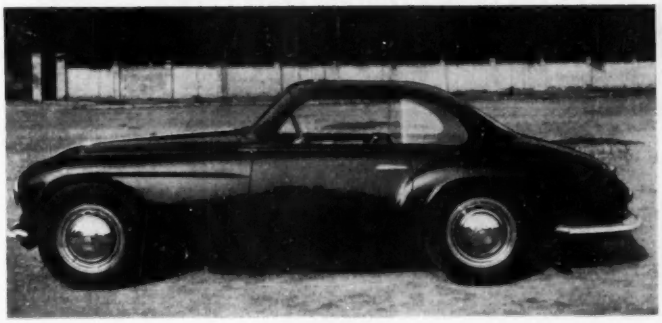
The Hudson Motor Car Co.'s profit for the second quarter of this year was nearly double that for the same period of 1949. The company earned nearly $4.3 million during the period, bringing the first half income to more than $6.5 million, compared with $5.9 million in the same period last year.

August Vehicle Production Second Highest on Record

Unofficial production figures of cars and trucks for August should allay any fears that the Korean war is having any appreciable affect on the industry at the present time. August output totaled just short of 820,000 units, the second highest mark on record, being surpassed only by June of this year when 857,000 vehicles were produced. Because of the fewer working days in September, production this month is expected to fall about 160,000 units below the August level, but nonetheless daily and weekly production should remain at a very high rate. The industry should pass the 1949 all-time yearly record of 6,250,000 units shortly after the middle of October, and barring any unexpected stoppages of major duration, total 1950 output should be in the neighborhood of 7.5 million vehicles. Actually the industry could fall back to an average of 100,000 weekly for the rest of the year and still turn out seven million vehicles. Sales continue at a high rate, but have definitely leveled off from the panic peak reached during the first few weeks after the Korean war started. Dealers report that the demand is now about the same or possibly slightly higher than existed just prior to the Korean war.

New Truck Registrations Set Record in July

When final figures of new truck registrations for July are in, the total will set a new record with approximately 110,000 trucks registered, according to R. L. Polk & Co. The previous all-time record of 108,168 new truck registrations was set in April, 1948. Registrations for the first six months of this year totaled 510,428, considerably ahead of the 465,426 registered for the same period last year and less than 25,000 under the all-time first half record established in 1945. It is believed that the total this year will equal or exceed the 1948 total. Preliminary figures indicate that passenger car registrations in July when officially tabulated will be the second highest month on record with about 575,000, being exceeded only by the June total of nearly 584,000 new cars.



FASTER BY FIVE

The body of this new model Alfa Romeo is the Superleggera aerlux coupe built by Touring of Milan. This is now a standard body on the 1950 6C2500SS third series Alfa Romeo. The roof of this model is fitted with a transparent panel that can be opened at the front for ventilation, and the streamline has also been so improved that the top speed of the car is now said to be about 5 mph faster.

De Soto Equips & Modernizes Body and Engine Plant

Chrysler Corp's De Soto Div. has completed equipping and modernizing the old Graham Paige plant in Detroit, which it acquired after the war, for use as a modern body and engine plant. About two-thirds of the 1.1 million sq ft of floor space will be devoted to production of bodies, with the remaining space to be used eventually for an engine plant. Capacity will be 60 bodies

an hour, and a two-shift operation is planned. The plant, which will be called the De Soto-Warren plant, has nearly eight miles of conveyor lines, and all body conveyors are automatic and controlled electronically. An unusual feature of the plant is a new type of body conveyor which permits the body to be rotated on a longitudinal axis making upper and lower sections available at work level. The entire operation was surveyed carefully, and the plant was designed to bring all operations to a convenient work level, and to eliminate as much manual handling as possible. The welding department has 540 gun welding machines, and guns with one unit making 198 welds in 17 seconds on the under body section.

1950 MOTOR VEHICLE FACTORY SALES FROM U. S. PLANTS*

	Passenger Cars	Trucks	Buses	Total Vehicles 1950	Total Vehicles 1951
First Quarter	1,342,803	294,137	551	1,637,491	1,376,069
Second Quarter	1,751,399	360,145	1,278	2,112,822	1,618,229
Total—Six Months	3,094,202	654,282	1,829	3,750,313	2,994,294
July	595,067	111,208	397	706,672	579,046
Total—Seven Months	3,689,269	765,490	2,226	4,456,985	3,573,332

1950 DOMESTIC TRUCK FACTORY SALES BY G.V.W.*

	5,000 lb. & Less	5,001-10,000	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	Over 26,000	Total
First Quarter	126,709	87,323	20,036	39,476	9,090	7,447	5,055	285,126
Second Quarter	188,072	95,209	21,510	48,180	11,572	10,427	7,557	322,527
Total—6 Mos.	294,781	122,532	41,546	87,656	20,652	17,874	12,612	587,653
July	47,590	20,991	6,550	13,489	3,790	3,489	2,684	98,573
Total—7 Mos., 1950	332,371	143,523	48,096	101,145	24,432	21,363	15,296	686,226
Total—7 Mos., 1949	263,880	172,251	48,561	99,302	17,325	11,946	8,609	621,674

* Automobile Manufacturers Association.

Automotive Sales Total 20% of Retail Trade

The importance of the automotive industries to the national economy is well known, but the Automobile Manufacturers Association has compiled some interesting statistics to prove it in its 1950 editions of *Automobile Facts & Figures*. The publication points out that automotive sales total $25 billion annually and account for more than 20 per cent of all United States retail trade, giving rise to more than 435,000 business concerns. At least nine million persons are employed today by various businesses directly related in some way to the automobile and truck business. Automotive sales and service trades last year employed 1.6 million, with the trucking industry alone giving jobs to more than five million persons. The publication also has an impressive list of statistics showing new high last year for vehicle production and registrations, special motor vehicle taxes, family ownership of automobiles, sales of parts and accessories, the number of registered drivers, and average life of vehicles. Exports, however, suffered a decline last year, showing only 287,785 vehicles, a drop from 436,217 in 1948.

Italy's Car Output Jumped in First Half of 1949

During the first six months of the present year, Italian automobile production jumped better than 72 per cent over the corresponding period of 1949. The total output for these six months was 60,076, compared with 34,586 a year earlier. A breakdown of this total shows 46,084 passenger cars, 8305 delivery vans, 3807 trucks, and 1880 buses. The best production month of the half year was May with 11,380 vehicles. Italian exports show an increase of nearly 25 per cent, these were entirely passenger cars and light delivery vehicles, which jumped from 7236 in the first half of 1949 to 9508 in the corresponding period of this year.

New Wage Hikes Remove Chances for Cuts in Car Prices

The latest round of wage increases touched off by Chrysler in late August not only removes all possibility for a price cut for automobiles and trucks, but makes an increase almost certain. In fact the upward trend has already started with Packard increasing prices on its new models by $81 to $106 on its volume line. Diamond T has also raised its truck prices six to eight per cent. Other independent automobile manufacturers have given no indication of what price they will put on their new models soon to be announced, but it is very likely that they too will be forced to increase prices. Even before the present wage round started, smaller companies were particularly under pressure. They not only had been forced to greatly increase their labor costs with pension programs, but also had been faced with rising prices of materials such as rubber products, steel, textiles and scarce metals.

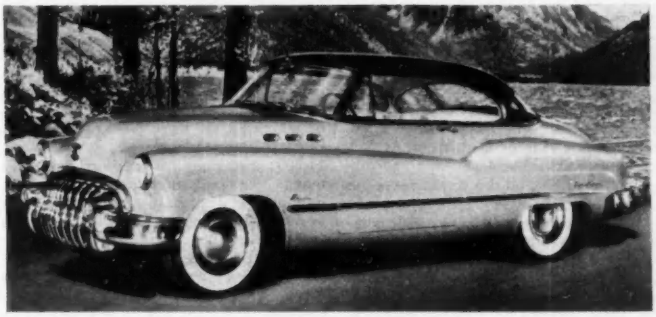
The current wage pattern is running a minimum of five cents to ten cents an hour for hourly-rated workers with an extra five cents for highly skilled employes such as tool, die, and maintenance workers. Settlements thus far for the two above mentioned classifications are: Chrysler, 10 and 15 cents; Ford, 8 and 13 cents; Hudson 7 and 10 cents; Briggs, 5 and 10 cents; Budd, 5 and 10 cents; Midland Steel Products, 10 and 15 cents; and Motor Products Corp., 10 cents. Increases to salaried employes at several of the companies averaged about seven per cent.

One important development in the latest round of wage hikes is adoption of the GM formula by three companies, Kaiser-Frazer, Packard, and Ford. K-F boosted hourly pay of its production workers by 12 cents, and its skilled and foundry workers by 17 cents.

Ford made history of a sort, when it scrapped its previous contract, which still had 19 months to run, and wrote a new one of five years duration calling for an 8 to 13 cent increase in hourly rates; pensions of $125 a month for employes; improved accident and sickness disability payments; longer vacation for men with high seniority; increased life insurance; maximum premium pay on seven-day operations; an escalator clause tying wages to the cost of living; and an annual improvement factor of four cents an hour, with the first one due June 1, 1951. The company's 30,000 salaried workers will also receive pay increases of an unspecified amount.

Several smaller supplier companies have adopted the GM formula, and it begins to appear that the plan may eventually be adopted by all or most of the automotive industries. At any rate since the formula places a definite floor below which wages cannot drop regardless of the cost of living and since the annual improvement factor is included, the pay scale in the industry at the end of five years is certain to be from 16 to 20 cents higher than it is now. Ford's average rate was about $1.65 an hour before the latest increase so that after June, 1954, it cannot be any less than $1.81.

Packard gave a general wage increase of four cents an hour when it



RUNNING MATE

This Buick Riviera model, in the Super Series, is a running mate to the Buick Roadmaster Riviera, one of the first of the hard-top models. The Super Riviera, scheduled for a higher production rate, incorporates all of the features of the Roadmaster Riviera.

signed its new five-year contract with the union. The Packard agreement follows the GM pattern of pensions and a cost-of-living clause which means that the Packard workers got an extra five cents an hour beginning Sept. 1st. In addition, the annual improvement factor of four cents an hour each year is part of the contract. Also 800 skilled workers got an additional wage increase of four cents an hour and 150 others receive raises of 12 to 18 cents an hour under an adjustment of wage inequities. Cost of pensions to Packard is particularly high because of the high average age of Packard employes which is understood to be in the neighborhood of 52 to 53 years. In addition to pensions up to $125 per month, including Social Security benefits, the agreement calls for hospital-medical insurance programs, vacation pay increases, union shop, and revisions in the working contract provisions.

Treasury Approves Ford Salaried Pension Plan

The Ford Motor Co. has received Treasury approval of an improved retirement plan for salaried employes and others not covered by UAW pensions. It provides a basic $100 a month pension including Federal Social Security benefits at normal retirement at 65 after 30 years of credited service and is non-contributory. In addition, employes with two years' service and earning more than $300 a month, may build up additional benefits by voluntary contributions of five per cent of salary over $300 a month. Annual retirement benefit is equal to 30 per cent of the total contribution over the years in addition to the basic benefit.

54 Automobile Exhibitors at London Show

In the London automibile show (Oct. 18 to 28), with 54 passenger car exhibitors, 10 American models will be shown: Chrysler, Dodge, Oldsmobile, Pontiac, Cadillac, Canadian Chevrolet, Hudson, Lincoln, Nash, and Studebaker. There are to be seven French makers, and two from Italy. This national character contrasts with that of the Paris show which will open the European series on Oct. 5, where the home makers are in a decided minority. A total of 500 exhibitors are united in the 10 sections of the London show. In the London truck show, which will be inaugurated on Sept. 22, there are 41 exhibitors in the vehicle section, all British, with the exception of Studebaker from America, and Panhard and Renault from France. The British truck show is held only on alternative years.

R. E. Olds, Automotive Pioneer, Dies at 86

One of the last of the automotive pioneers, Ransom E. Olds, died at Lansing, Mich., Aug. 26. He was 86 years old. The founder of the Oldsmobile and Reo companies had been ill for several weeks prior to his death which was attributed to the complications of old age. His first venture into the automobile business came in 1896 when he organized the Olds Motor Vehicle Co. with a capital of $50,000. In 1899 he organized the Olds Motor Works, capitalized at $350,000, and built a large factory in Detroit which turned out 4000 of the famous curved-dash Runabouts the first year—an unheard of total for those times. When the Detroit plant burned in 1902, Mr. Olds moved his operations to Lansing where he continued the company that was to become the Oldsmobile Div. of General Motors in 1907. He sold his interest in the company in 1904 and formed the Reo Motor Car Co. He left an estate of approximately $4.5 million. The bulk of his fortune, however, had been distributed among his family many years ago.

KEEPS IT COOL

One of two new model refrigerated multi-stop delivery trucks introduced by the motor truck division, International Harvester Co. is this low-temperature LM-150 International truck with Metro body. This model features an automatically-operated, constant-temperature refrigeration unit which provides a temperature range of 10 to 35 F. The model provides 256.4 cu ft of refrigerated space.

Sobey President Emeritus of GM Institute

Albert Sobey, president of GM Institute and only director of the school in its history, has been named president emeritus and consultant on special assignments. Guy R. Cowing has been named president and director. He was previously assistant director, having held that post since the school was founded.

Study Shows Effect of Equipment on Employment

Compiled from figures of the U. S. Dept. of Commerce (data re machines) and the U. S. Dept. of Labor (employment figures), a year by year (1910 to 1950) study of the effect on employment of production workers of installation of so-called "labor-saving" equipment in U. S. industry is contained in a booklet just released by the Michigan Tool Co., Detroit. The booklet reveals that in every year in which the rate of installation of industrial equipment increased, this increase was either accompanied by or followed by an increase in total employment of production workers in industry. Similarly for every year in which there was a decrease in the rate of acquisition of new machines, the decrease was accompanied or followed by a decrease in employment. In every case where the increase or decrease in rate of installation of new equipment was particularly sharp, the corresponding increase or decrease in employment of production workers was also sharp. Where there was little change in rate of installation of equipment, corresponding employment figures also showed little change.

British Made 397,500 Units in First Six Months of 1950

The half yearly production of the British automobile industry was 262,500 passenger cars and 135,000 trucks and buses, of which 80 and 65 per cent, respectively, were exported. This is an increase of practically 100,000 over the period January to June, 1949. Australia increased her imports to 70,000 vehicles, of which 26,000 were trucks; Canadian imports jumped to 38,500; Sweden took 11,500; and Belgium exceeded the 4000 mark. Agricultural tractor production during the first half of the year was 56,500, of which nearly 70 per cent were exported.

The British home market continues to be starved, with only 110,000 cars given over to home use this year against orders for over a million. Some relief may be expected towards the end of next year, when the new Abbey Rolling Mills at Margan, in South Wales, get into full production. Against this, however, is the possibility of military contracts cancelling out all relief for the domestic market.

GETS UP THERE

Now part of the standard equipment on Mack's new model 85 fire truck, this specially-mounted ladder can be fully extended it is claimed to its 75-ft length in less than 60 sec. The Mack chassis on which the ladder body is built, is powered by a six-cyl 213-hp Mack fire apparatus gasoline engine. The truck has a wheelbase of 240 in.

K-F Purchases Affect 400 Communities

Kaiser-Frazer has made an analysis of its purchasing operations, indicating the influence of the automotive industries on the economic life of communities scattered throughout the country. The report shows that of the $20 million K-F spends monthly for parts and materials, Michigan vendors get the largest single slice of the business with an average of $313.58 worth of parts and materials bought in that state for each car built. More than $200 worth of that total comes from the Detroit area, totaling $40 million worth of business in a 200,000 car year. This total does not include materials purchased by the company for manufacturing, but which do not become an actual part of an automobile. Other states by volume of parts and material purchased on a per car basis are: Indiana, $182.10; Ohio, $144.45; Pennsylvania, $126.57; California, $76.38; Massachusetts, $29.07; Wisconsin and Missouri, $24.00 and Illinois, $14.29. Smaller amounts of materials are purchased from vendors in the rest of the states. The report shows that K-F deals with suppliers in more than 400 communities who give jobs to more than 47,000 employes.

Rausch Joins Willys as Vice President

Ray R. Rausch, well known to the automobile industry from his many years service with Ford, is returning to the automobile field as vice president and executive assistant to Ward M. Canaday, president and chairman of

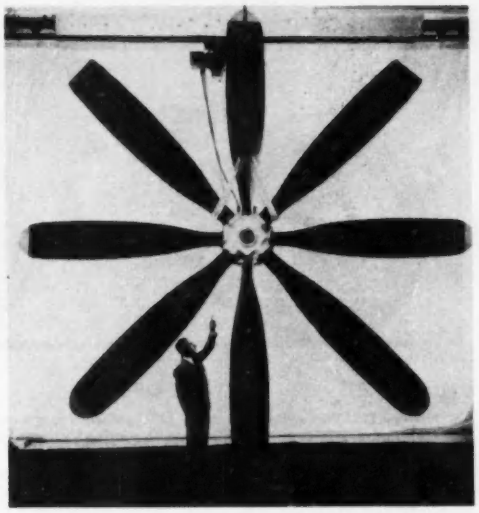
Willys-Overland. After he left Ford, Mr. Rausch was associated briefly with the Tucker Corp. and then for two years with General Electric as consultant to the president. His appointment to the top Willys management is a further step in that company's program of strengthening its organizational staff. Other executives who have joined the company during the past year who are well known to the automobile industry include Clyde R. Paton, formerly chief engineer of Packard, who is director of engineering, and Lyman W. Slack, previously Packard sales manager, who is vice president in charge of distribution.

PTC Testing Two Buses Using Propane

The Philadelphia Transportation Co. is now testing two Twin Coach buses using propane. The two buses were converted for the experiment with special equipment furnished by the Twin Coach Co.

OCTOPROP

Called the Octoprop, what is said to be the world's largest and most powerful aircraft propeller — this eight-bladed giant over 19 ft in diameter — has been delivered to the Air Materiel Command at Wright Field, Dayton, O., by the Propeller Div., Curtiss-Wright Corp., Caldwell, N. J. The new dual-rotation propeller is a flight model designed for use with a gas turbine engine at 10,000-15,000 hp.



Ford to Build Assembly Plant at Kansas City

Ford will soon start construction of still another new assembly plant in its expanding network of new production units throughout the country as part of its $500 million postwar expansion and modernization. The new assembly unit will be built near Kansas City, Mo., and will have a capacity of 700 Ford cars and trucks daily. Operations are expected to begin early in 1952. The present Kansas City plant is currently being renovated and will be used by Ford for some other purpose.

Republic Industries Reacquires Jacobs Aircraft Engine

The Barium Steel Corp. has announced that its wholly-owned subsidiary, Republic Industries, Inc., has reacquired the Jacobs Aircraft Engine Co. The reacquisition returns to Barium a plant at Pottstown, Pa., engaged in building and reconditioning engines and in subcontract work for other manufacturers.

Electric Auto-Lite Shows Rise in Net

The Electric Auto-Lite Co. reports a substantial increase in earnings during the first six months of this year as compared with the same period in 1949. Net profit for the first half of 1950 was $5,187,591 compared with $3,593,707 for the same period a year ago. The company explains that its 1949 earnings were reduced by a write-down of inventory and the expense of moving equipment to a new plant location.

Stress Design for Lower Costs at SAE West Coast Meeting

Continued intelligent design for lower maintenance costs and lower operating costs was the theme of the SAE National West Coast Meeting held in Los Angeles. More than 300 automotive engineers heard 14 papers on fuels and lubricants, Diesel engines, transportation and maintenance, and truck and bus activity. Defense mobilization injected a serious note into the meeting. The importance of immediate and all out cooperation between all branches of the automotive industries and the armed services was stressed by J. C. Zeder, SAE president, and director of engineering and research, Chrysler Corp.

France Starts Making Two New Military Vehicles

France has started production of two new army-type vehicles: a jeep produced by the Delahaye company and an armored car built by Panhard & Levassor. The Delahaye jeep has the same general outline as the American vehicle, with accommodation for four persons and supplies. Features are a four-speed synchromesh transmission with a reduction gear, giving a range of 2 to 60 mph. All four wheels are independently sprung, by adjustable torsion bars. There is a power take-off, differential lock, interchangeable front and rear axles, and drive to either two or four wheels.

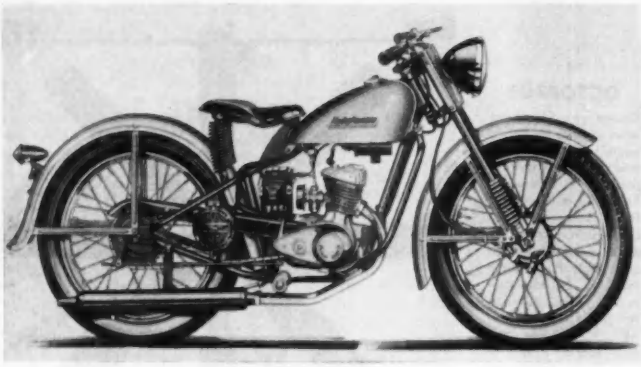
The Panhard & Levassor armored car is an 8 by 8 model, all wheels driving and steering, with provision for raising the two central axles for fast driving on improved roads. Heavily armored, with a speed of 62 mph, the Panhard & Levassor unit has both a front and a rear driving cab, with the same speed performance in either direction, thus avoiding turning movements.

ASA Approves Safety Code for Industrial Trucks

Applying to industrial trucks of the driver-ride and driver-lead types (such as platform trucks, tractors, low-lift trucks, high-lift trucks, fork trucks, and special purpose trucks), safe practices in design and use have been established by an agreement among users, safety engineers, and manufacturers of these trucks, according to the American Standards Association. The recommendations have been published as a Safety Code for Industrial Power Trucks and approved by ASA as American Standard (B56.1-1950).

GE Train to Visit 29 Mid-West Industrial Centers in Fall

Heading west, the General Electric Co.'s 10-car exhibit train, the "More



ONE OF FOUR

This new 1951 Harley-Davidson model 125 lightweight is one of four models in the new 1951 line: the 74-cu-in. Hydra-Glide, with overhead valves, developing 53-55 hp; the 61-cu-in. model with the same features, developing 40-42 hp; and the 45-cu in. side valve model, developing 23-25 hp.

Power to America Special" will visit 29 midwestern industrial centers this fall before swinging south, down the Atlantic coast. Arrival dates and number of exhibit days on the "Special's" midwestern tour include the following: Sept. 18, Detroit, Mich., five days; Sept. 25, Saginaw, Mich., one day; Sept. 26, Lansing, Mich., one day; Sept. 27, Grand Rapids, Mich., one day; Sept. 28, Kalamazoo, Mich., one day; Sept. 29, Jackson, Mich., one day; and Oct. 2, Ft. Wayne, Ind., one day.

Dodge Gets Truck Order from Post Office

Dodge has received its fourth contract for mail trucks for the Post Office Dept. in the last 18 months. The total number of trucks ordered during that period amount to 5921 units or a total of $10,250,000. The latest order amounts to $5.5 million for 3750 special trucks with insulated and ventilated bodies of 175 cu ft capacity.

Tire Output May be Cut 1.5 Million a Month

Although voluntary reductions in the use of rubber by tire manufacturers will reduce production of tires an estimated 1.5 million units a month, there will still be enough for all essential use, according to industry spokesmen. One result of the pinch in rubber, particularly crude, is a greater use of synthetic in passenger car tires, leaving more natural rubber for large truck tires, which cannot be made satisfactorily with synthetic. Also there has been a switch back to cotton cord where rayon had been used in some tires because of the tight supply of that textile.

GM Holds Price Line Despite Wage Hike

GM is holding the line on prices despite a five cents an hour wage increase to its hourly-rated employes effective Sept. 1, under its cost of living wage agreement with the union. Salaried personnel receive a cost-of-living boost of $25 for the three months. Previously when wages were reduced three times under the contract, GM lowered prices of its cars and trucks proportionately. C. E. Wilson, GM president, said that it is hoped that the wage increase and the upward price trend in basic materials is of a temporary nature only.

Drop Forging Association Holds Special Fall Meeting

A special fall industry meeting of the Drop Forging Association was held in Cleveland Sept. 14 and 15. Significantly the agenda covered topics relating directly to the military program and its relation to the effect on the drop forging industry. Among the topics discussed were the following: "Operation of the National Organization Branch" by Lt. Cdr. Clarence Cisin, Industry Liaison officer, Office of Public Information; "Procurement Methods of the Armed Forces" by Col. R. H. Howard, Chief, Office of Procurement Methods, Munitions Board; "Industry Advisory Committees and Steel Allocations, by Frank T. McCue, Chief, Iron & Steel Div., Office of Industry and Commerce; "How Military Requirements Will or Will Not Affect Our Industry" by Robert C. Goodwin, Director, Bureau of Employment Security, Dept. of Labor.

AERIAL AMBULANCE

To be built by the Kaman Aircraft Corp., Windsor Locks, Conn., this new helicopter, designated the HOK-1, has twin intermeshing rotors powered by a single engine. The Navy has ordered a limited number of this new liaison type helicopter, designed to carry a pilot and three passengers, and to be readily converted into an aerial ambulance for two stretcher patients and a medical attendant.

INDUSTRIES

United Specialties Buys Alabama Plant

The United Specialties Co., automotive parts manufacturer of Chicago and Philadelphia, has purchased the Acme Pressed Steel Corp. plant at Birmingham, Ala. The plant will be operated as a wholly-owned subsidiary, and will be devoted to continuation of toy manufacturing, with production of air cleaners to be added. Output is expected to be about 4000 cleaners a day at capacity late next year.

White Announces New Diesel Line of Buses

A new Diesel line of buses, the White 1100 Diesel in large capacity sizes, has been announced by the White Motor Co. The new 1100 Diesel is powered by a Cummins six-cyl, 200-hp engine.

Reclaim Rubber Output Stepped up Sharply

B. F. Goodrich Co. is reopening a reclaim rubber plant as a result of government restriction on the use of new rubber, and the high prices for natural rubber. As a result of these conditions, production of reclaim rubber is at the highest rate since 1943 and may go to 300,000 long tons.

GM Pension Cost Set at $67 Million a Year

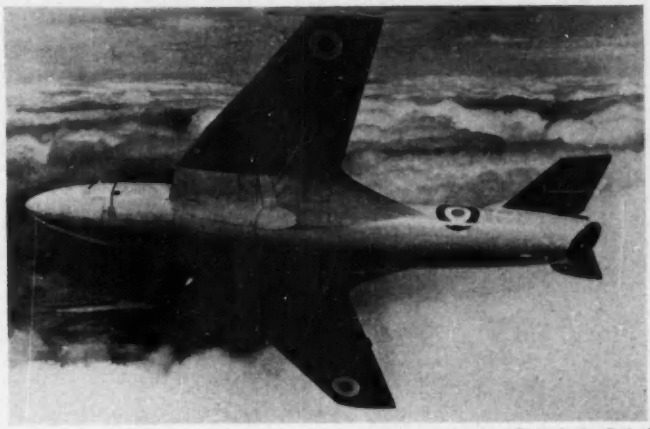
Pension benefits are costly. GM estimates that its pension plans for hourly-rated and salaried employes, will cost the company more than $67 million a year. The estimate is based on recent increases in Federal Social Security benefits.

Canada Hikes Import Quota for U. S. Cars and Parts

The Canadian government will increase quotas on American made automobiles and parts by 20 per cent beginning Oct. 1st, according to a report from Ottawa. At the same time all restrictions on importation of automobile tires made in the United States will be lifted.

Mexico Announces Yearly Quota for Car Industry

The Mexican Government has announced the July, 1950, to July, 1951, quota for the automobile assembly industry: unlimited production of trucks, and an increase of 40 per cent over the 1949-1950 quota for passenger cars (see AUTOMOTIVE INDUSTRIES, July 15, 1950, page 36). At the same time, the companies have announced a three per cent price reduction on Chevrolet, Ford, Plymouth, Pontiac, and Nash cars as well as on all trucks.



Courtesy of *Flight*, London, England

ONE OF SIXTY

Powered by a Rolls-Royce Nene engine, the new Hawker P.1081 swept-back wing jet fighter, shown here, was one of 60 different type of aircraft recently displayed at the annual show of the Society of British Aircraft Constructors in Great Britain

Keutgen Made Assistant to Ford Vice President

George O. Keutgen, formerly an analyst for the capital investment department, has been appointed an assistant to Del S. Harder, vice president in charge of manufacturing for Ford. He succeeds R. E. Krafve who has been made general manager of the newly formed defense production division. In his new post, he will be responsible for special studies and analyses for Mr. Harder and for coordinating administration, organization, and procedure activities.

France Made 133,817 Cars in First Five Months

French automobile production for the first five months of this year totaled 133,817, compared with 116,223 for the corresponding period of 1949. All of the increase was in passenger car output which jumped from 70,285 to 97,485. The production of all other types of vehicles showed a drop. Buses and coaches totaled 802, trucks 35,211, road tractors 243, and special vehicles (ambulances, fire fighters, etc.) were 76. Renault headed passenger car production with 31,057 units for the five months, followed by Citroen, Peugeot, Simca (Fiat license) Ford, and Panhard. Renault also headed truck output, followed by Citroen, Peugeot, Simca, Berliet and Ford.

Willys Producing Station Wagon with 4-Wheel Drive

Willys Overland has introduced its 1950 model four-wheel drive all steel station wagon which was not included in the new model introduction last spring. Gradability of the vehicle loaded to one-half ton capacity has been increased 15.4 per cent over the previous model. The increase in power is due to the new four-cyl, 72-hp F-head engine which is standard equipment. The station wagon can negotiate grades of 66.73 per cent in low gear.

Correction to Article on Russia's Strength

In Table II of the article, "What Is Russia's Industrial Strength," August 15 issue of AUTOMOTIVE INDUSTRIES, Soviet steel ingot production in 1949 was 21.2 million metric tons, giving a total of 26 million metric tons for the East and an East/West ratio of 0.22. A typographical error occurred in the total car and truck production figure for the East, which should have been 454,000 units instead of 444,000.

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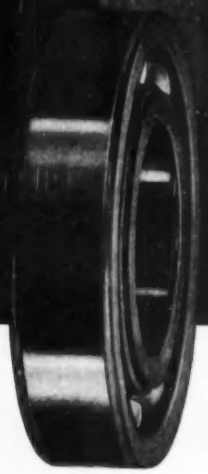

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BALL BEARINGS

NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONNECTICUT

Men in the News

Current Personnel Appointments and Changes at Plants of Automotive Manufacturers and Their Suppliers.

CALENDAR

OF COMING SHOWS AND MEETINGS

Conventions and Meetings

Instrument Soc. of Amer. Conf. & Exhibit, Buffalo .....Sept. 18-22
British Truck Show, London....Sept. 22-30
Assoc. of Advertisers Annual Mtg., Chicago .....Sept. 25-27
Nat'l Metal Trades Assoc., New York City .....Sept. 27-29
Paris Automotive Show, Paris....Oct. 5-15
Industrial Pkging. & Materials Handling Expos., Phila.....Oct. 10-12
SAE Nat'l Transportation Mtg., New York City .....Oct. 16-18
Nat'l Safety Congress, Chicago..Oct. 16-20
Society of the Plastics Industry Nat'l Conference, Swampscott, Mass. Oct. 18-20
British Passenger Car Show, London, Oct. 18-28
Amer. Society for Metals' Annual Nat'l Metal Congress & Exhibition, Chicago .....Oct. 23-27
Amer. Welding Soc. Annual Mtg., Chicago .....Oct. 23-27
Nat'l Lub. Grease Inst., Chicago, Oct. 30-Nov. 1
Amer. Soc. Body Engrs. Technical Convention, Detroit .....Nov. 1-3
Ind. Management Soc. Management Clinic, Chicago .....Nov. 2-3
American Petroleum Institute Annual Mtg., Los Angeles .....Nov. 13-16
1st Annual "Motorama," Los Angeles .....Nov. 16-19
Power & Mech. Engineering Exposition, New York City ...Nov. 27-Dec. 2
Nat'l Standard Parts Assoc. Convention, Chicago .....Dec. 1-2
Auto. Service Industries Show, Chicago .....Dec. 4-8
Nat'l Assoc. Engine & Boat Mfrs. Nat'l Motor Boat Show, New York City .....Jan. 12-20
Plant Maint. Show & Conf., Cleveland .....Jan. 15-18
Soc. of Plastic Engrs., New York City .....Jan. 18-20
4th Annual Hot Rod and Motor Sports Show, Los Angeles ..Jan. 25-28
Nat'l Auto. Accessory Mfrs. Assoc., New York .....Feb. 5-8
Amer. Soc. Tool Engrs., New York City .....Mar. 17
Pacific Automotive Show, Seattle Mar. 21-24
International Auto Salon, Geneva Mar. 8-18
Amer. Soc. Lubricating Engrs., Phila. .....Apr. 16-18
Amer. Mgt. Assoc., Nat'l Packaging Expos., Atlantic City .....Apr. 17-20
A.E.R.A. Convention, Chicago ....May 7-9
Nat'l Air Races, Cleveland Airport May 19-20
Amer. Society for Quality Control, Cleveland .....May 23-24

Willys-Overland Motor Co.—The election of **Raymond R. Rausch** as Vice-President and Executive Assistant to the president has been announced. **Leo Younger** has been named manager of the market research and sales analysis department.

Willys-Overland Motors, Inc.—**Charles R. Vincent** has been appointed manager of the Farm Sales department. Mr. Vincent will be assisted by **Robert H. Green** and **William W. Smelker.**

Dodge Div., Chrysler Corp.—The appointment of **Walter E. Foraker** as Asst. Director of Distribution has been announced.

Buick Motor Div., General Motors Corp.—The appointment of **L. D. Loggins** as Asst. General Service Manager for the division, has been announced.

The Four Wheel Drive Auto Co.—**Donald M. Russell,** Director of Accounting and Asst. Treasurer, has been elected a director of the company's two subsidiaries, The Eagle Mfg. Co. and The Four Wheel Drive Auto Co., Ltd., Canada.

Fruehauf Trailer Co.—Announcement has been made of the appointment of **Robert A. Gregg, Jr.,** as Asst. Controller in charge of factory and general accounting.

Detroit Diesel Engine Co., Div. General Motors Corp.—**William Fox** has been appointed Publicity Manager of the Division.

Ford Motor Co.—**George O. Keutgen** has been appointed assistant to **Del S. Harder,** Vice-President-Manufacturing.

Aircraft Industries Assoc.—**Al Cline,** Director of Public Relations, has been elected chairman of the Public Relations Advisory Committee, Western Region, Aircraft Industries Assoc. **Leland R. Taylor,** Asst. to the President, North American Aviation, was elected vice-chairman of the Assoc.

Pacific Airmotive Corp.—**Albert C. Essig** has been appointed director of public relations. **W. G. McDowell** is General Sales Manager; **Richard D. Maystead,** Gen. Manager, Manufacturing Div.; **M. A. Wachter,** Asst. General Manager, and **D. R. Wetmore,** Asst. to the General Manager.

Boeing Airplane Co.—The appointment of **Ralph L. Bell** as Asst. Sales Manager has been announced.

Potter & Johnson Co. (Div. Pratt & Whitney)—**J. Earle Makant** has resigned as Vice-President and Factory Manager, having rounded out 34 years of service with the company; **Wilfred J. Pender** has been appointed Factory Manager. **Edward P. Gillane** has been appointed Vice-President and General Manager.

Purolator Products, Inc.—**Herbert J. Rieth** has been appointed Assistant Purchasing Agent.

Reynolds Metals Co.—**John E. Blomquist** has been appointed Industry Manager, Industrial Parts Div.

Adel Div., General Metals Corp. (formerly Adel Precision Products Co.)—**Fred T. Miller** has been named Vice-President of engineering and sales and **Richard A. Stumm,** Vice-President of Manufacturing.

Great Lakes Tractor & Equipment Co.—The appointment of **W. G. Davidson** as Vice-President, in charge of sales, has been announced.

Shakeproof, Inc.—(Div. Illinois Tool Works)—**Fred K. Knohl** has been appointed Chief Engineer. **Kenneth C. MacKay** has been named Budgetary Control Manager. **Elbert Faust,** formerly Production Supt., has been named Asst. Works Manager, and **Henry Archer** has been named to succeed him as Production Supt.

American Steel & Wire Co.—**Walter C. Anderson** has been appointed asst. Manager of construction materials products sales div. **Earl N. Graf** has been named asst. Manager of wire rope products sales div. The headquarters of both men is Cleveland.

Westinghouse Electric Corp.—**Dr. D. M. Wroughton** has been appointed manager of chemistry research at the company's Atomic Power Div. He succeeds **Dr. E. Bruce Ashcroft** who has been appointed advisory engineer in the chemical dept. of Westinghouse Re-

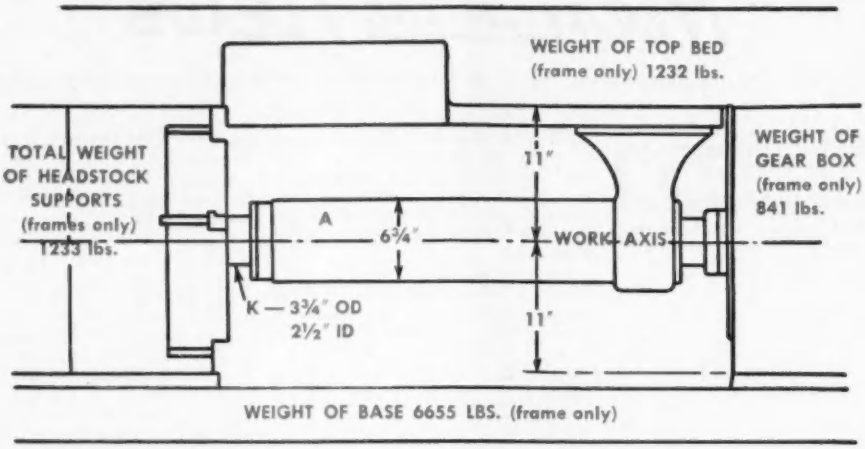
(*Turn to page* 130, *please*)

Necrology

William Joseph Davidson, 59, executive engineer, General Motors Corp., died on Sept. 4 in Goderich, Ont., Canada.

Clarence A. Pfeffer, 63, consultant and business analyst, former treasurer, Chalmers Motor Co., and former president, Saxon Automobile Co., died on Sept. 3 in Detroit.

Thornton W. Tinkham, 59, well known in automotive manufacturing, former general manager in charge of production, Bendix Aviation Corp., and vice president and director of overseas manufacturing for General Motors Corp., died in New York City on Sept. 9.



MAKER OF "HISTORIES"

The above drawing illustrates a Tooling Area that has staged many outstanding cases of machine adaptation and performance. Case histories are very useful as examples of machine adaptation, but their blanket use as unqualified proof of dependable performance is not convincing.

Buyers know that varying requirements and conditions of various plants make "buying what the other fellow buys" an unsafe practice. They know that good case histories will result if machine facilities have been properly selected. No plant could long afford to have it otherwise.

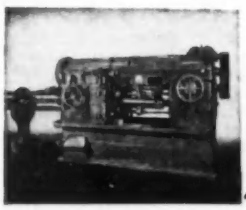
A "top performer" of the 1½" SIX SPINDLE CONOMATIC TOOLING AREA, shown above, is the MAIN END SLIDE. The specific data given tells why:

1. **It has a greater maximum load recommendation and a stronger frame support than the main end slide of any other "automatic".**

   The 272 lb. alloy carburized steel Main End Slide, A, is 33⅝" long, and has a maximum load recommendation of 4800 ft. lbs. Its round surface is machined to close limits. It is supported in nickel iron, split, sleeves on the alloy steel Way, K, with a total bearing of 136.9 sq. ins.

2. **It handles more work; has more adaptable tooling positions, and more selective feeds, than the main end slide of any other "automatic".**

   The 27⅞" tooling-length of the Slide handles shaft jobs up to 18" in length. The 2⅝" swing clearance permits die-head threading to full machine capacity in any, or all, six positions without Slide alteration. Nine pairs of pick-off gears give 68 feed changes for each work spindle speed.



Buyer's Comparison Chart will guide you to full information

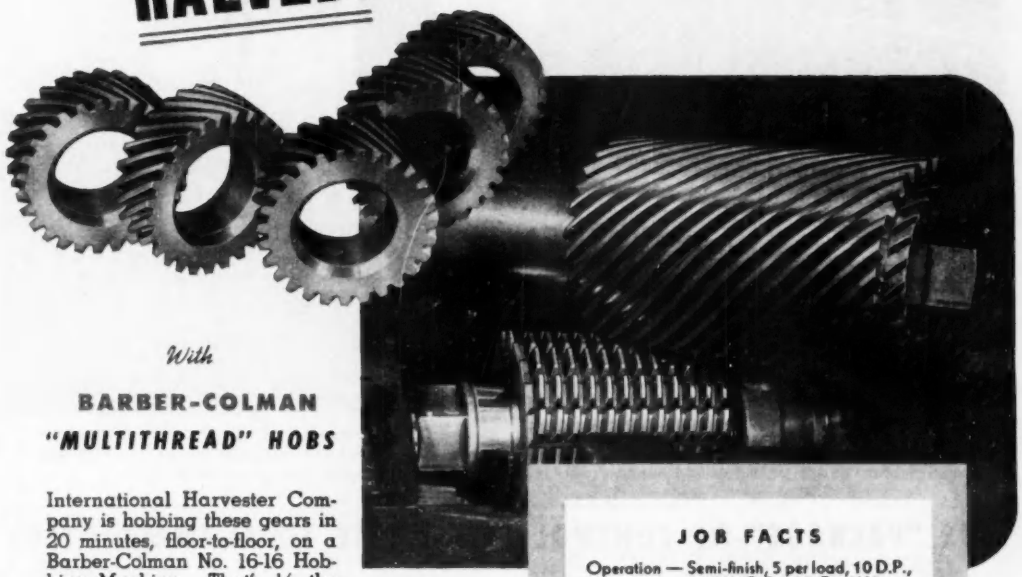
A Comparison of ALL Automatics is in Favor of Cone

Conomatic

CONE AUTOMATIC MACHINE COMPANY, INC.
WINDSOR, VT., U.S.A.

HOBBING TIME HALVED!

AT INTERNATIONAL HARVESTER



With

BARBER-COLMAN "MULTITHREAD" HOBS

International Harvester Company is hobbing these gears in 20 minutes, floor-to-floor, on a Barber-Colman No. 16-16 Hobbing Machine. That's ½ the time required before using Barber-Colman *"Multithread"* hobs. Tool life is 200 gears per sharpening. Involute is held within .0008", and spacing within .0003" tooth-to-tooth and .0008" total index.

More threads, more production! That's the simple theory on which these hobs work. Double the number of threads, and you double the speed of indexing. The overall production increase varies for each job (some jobs, of course, are not adaptable to *"Multithreads"*).

This is only one of many actual cases where *"Multithread"* hobs have worked production magic. A Barber-Colman Hob Engineer will be glad to discuss the possibilities with you.

JOB FACTS

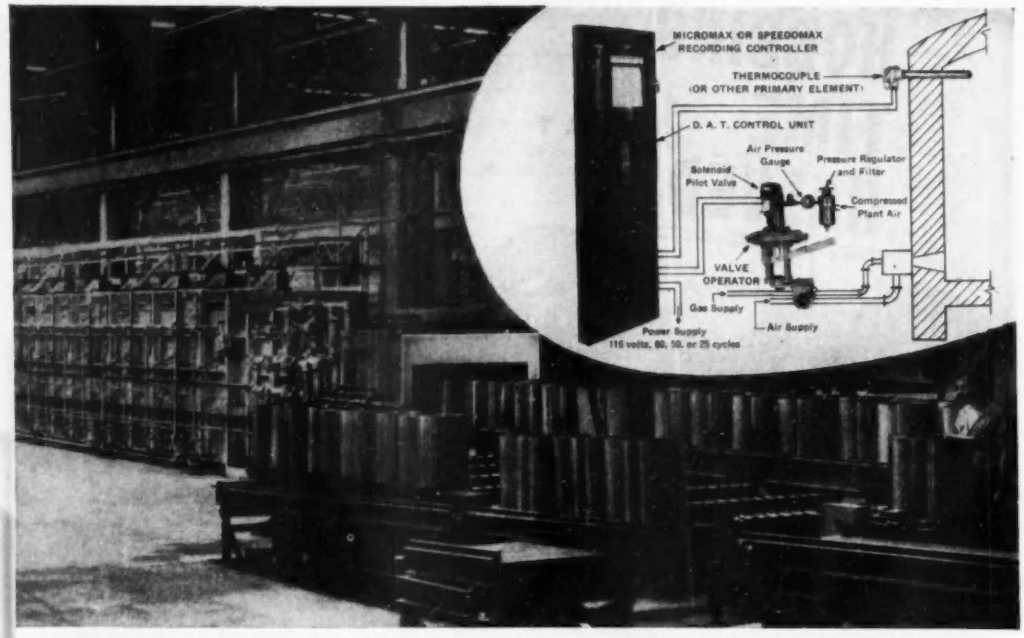
Operation — Semi-finish, 5 per load, 10 D.P., 3.696" O.D., 27 T., 6¼" cut.
Material — SAE 1137 steel
Hobs — B-C Double Thread 4" x 4" x taper bore
Fl-to-Fl — 20 minutes per load
Feed — .051"/rev. Speed — 139 RPM
Tool Life — 200 pieces per sharpening

Barber-Colman Company

GENERAL OFFICES AND PLANT, 7837 LOOMIS ST., ROCKFORD, ILLINOIS, U. S. A.

CHECK THIS DATA

Send for new release on Production Increases Gained Through Use of "Multi-Thread" Hobs. Ask for Bulletin 7837.



One of four 119-foot annealing furnaces built by Surface Combustion Co., and The Electric Furnace Co., for Scovill Manufacturing Company's new $10 million continuous strip mill. Crediting L&N D.A.T. pyrometric control on all these furnaces, Scovill says: "D.A.T. is taking a big part in helping us turn out the most uniform, high-quality brass we've ever made." Sheet is annealed in 2,000-lb coils; capacity is 32,500 lbs. per hour per furnace.

THIS "PACKAGE" OF CONTROL FITS ITSELF TO FURNACE NEEDS

And Only L&N Can Supply All Its Features!

SCOVILL'S latest success in controlling temperatures in brass strip-annealing furnaces is doubly interesting because it shows what can be done with other thousands of industrial furnaces. Small units may need only one instrument, instead of Scovill's five per furnace, but the principle's the same. Any furnace which can be controlled by turning fuel "on" at a predetermined low temperature, and turning it "off" at a predetermined high, will get its best possible regulation by D.A.T. Control.

D.A.T. excels for two reasons. First, it takes the "predetermined" out of the on-off action. Second, it adds full proportioning action. Instead of operating at predetermined temperatures, D.A.T. acts earlier or later, depending on change in heat demand. Only D.A.T. supplies all these features.

Increased production resulting from unusual uniformity is the great advantage of D.A.T. but other points are worth remembering: (1) Fuel can often be saved because less heat is lost up the stack. (2) Valve and burner sizes are not particularly critical. (3) D.A.T. can often modernize an old furnace, because it's so easy to install.

D.A.T. is just one of several L&N Controls. Call us for service or information in selecting equipment for any temperature-control problem. Address nearest office or 4966 Stenton Ave., Philadelphia 44, Pa.

TYPICAL RESULTS

D.A.T. exactly adapts its action to the upsets, load changes and lags of the furnace. This means it holds temperature in line for all normal changes in furnace charge, ambient temperature, temperature control point, etc.

D.A.T. offsets many inherent lags or delays in "sensing" temperature changes, such as that due to thermocouple protecting tubes.

D.A.T. operates equally well on furnaces of full-muffle, semi-muffle, open firing and conventional radiant-tube design.

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You will find Johnson Engineers willing to help you decide which type bearing is best suited and to design it for the application. As we manufacture all types of sleeve bearings, we base all of our recommendations on facts, free from prejudice.

Johnson Bronze

SLEEVE BEARING HEADQUARTERS

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A new Hoof Product, of interest to all manufacturers of industrial engines, will be announced soon.

Engineering and performance data will be presented on this page in an early issue.

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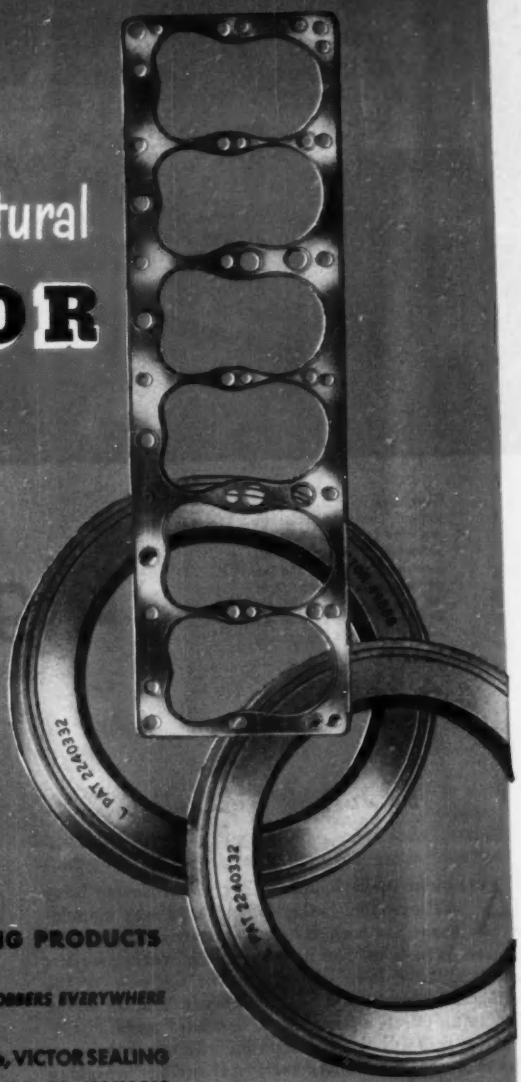

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Gaskets and Oil Seals

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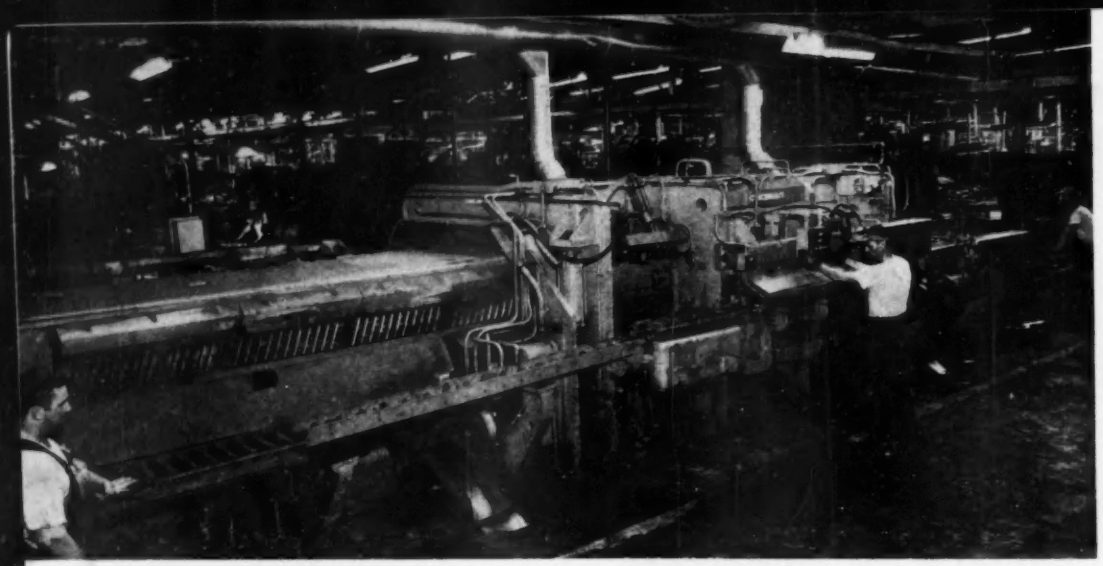


Front view of the big Cincinnati surface broaching machine set up at Buick for broaching cylinder heads. Castings are fed to the machine from the extreme right, on the conveyor. At the extreme left is a view of one section of the broaching tools

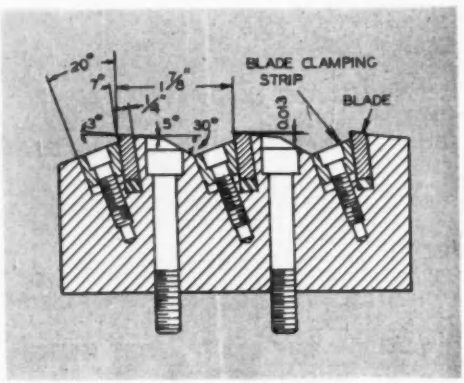
Big Broaching
Boosts Cylinder

By Joseph Geschelin

ALTHOUGH the technique of surface broaching large castings such as cylinder blocks and cylinder heads has been variously employed in the automotive industries for a great many years, serious problems have been encountered in the past in the automatic broaching of cylinder heads because of the damaging effects of scale, fins, and hard spots.

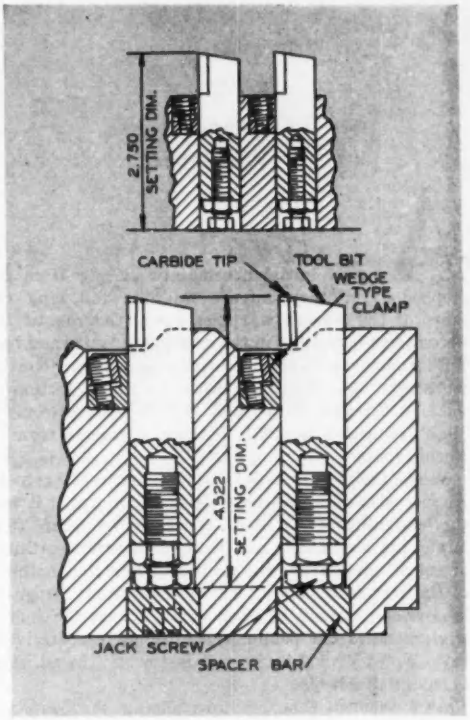
As a result there is more than passing interest in the enormous Cincinnati horizontal surface broaching machine installed recently at Buick for the broaching of cylinder heads for the 1950 Super engine. Disregarding previous concepts, this machine is completely automatic in cycle from load to unload and finishes four sides of the head at two stations. Nor does that tell the whole story. In the first place, the Buick head is produced to high hardness, harder than any of the other iron castings in the engine, to prevent valve seat pounding. In addition, the castings are processed as received from the foundry without removing fins, and to make the job still tougher most of metal removal is in the form of interrupted cuts.

As illustrated, the Cincinnati broach is a mammoth piece of equipment weighing some 60 tons and about 56 ft in length. In the cycle of operations rough castings are loaded on the conveyor at the extreme right and move downward to the loading station, one by one. Loading of work into the first station fixture is entirely automatic and part of an automatically controlled cycle from load to unload, by a hydraulic transfer mechanism. The drive to the broaching ram is a typical planer drive of rack and pinion type.



Typical mounting of finisher blades

Easily the most impressive feature of the machine



Typical mounting of carbide tipped bits as used in roughers. Large size is used for first, second, and third roughers of top and bottom of head. Small size is used for second and third roughers of cover face and manifold face

is the enormous ram which carries two independent sets of broaching tools—one for the top face and push rod side; the other for the bottom face and manifold port side. To reduce both ram stroke and ram length, work stations are so arranged that the first operation is on a lower level than the second, thus making it possible to mount the broaching tools in two staggered rows.

Design of the broaching tools is unique and unconventional in many respects. Four broach holders are used for each cutting position:

1—A first rougher which embodies solid Tantung blade-type bumper teeth to remove fins on the cover face and manifold face; and carbide-tipped bits for first roughing of the top and bottom.

2—A second and third rougher—semi-finish cuts—in which all teeth are carbide-tipped. All of these tools are exactly the same except for tooth height.

3—A finisher section in which all teeth are of solid carbide blades.

What is of great importance to Buick is simplicity with which individual tools or tool sections can be removed, dressed, and replaced.

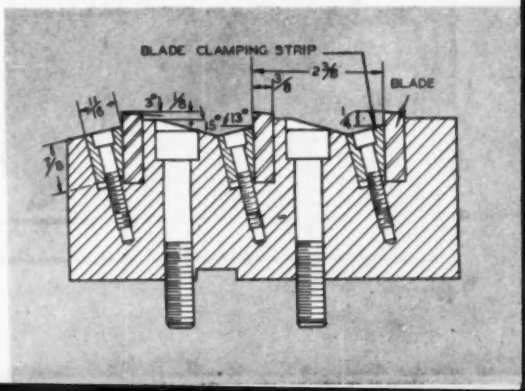
Getting down to the operation itself, consider first that the Super engine head is about 32 in. long in the rough and extremely hard. It is used without precleaning and comes to the machine with hard, rough fins. Under production conditions the broach is expected to remove at least ¼ in. of stock from each of the four sides, without counting the fins. It is indeed remarkable that so much metal can be removed with facility with a ram speed of 140 sfm.

Incidentally, it is of interest to note what this order of metal removal represents quantitatively. By actual weight, a representative head in the rough weighs 100 lb. After broaching the head weighs 93 lb. Consequently, the broach removes about seven lb of cast iron at 140 sfm of the ram. This produces a lot of metal chips. To meet this problem the machine is arranged to drop chips from both cutting stations onto a chip conveyor below floor level, the latter then transporting the chips to an automatic unloading station.

To initiate the cycle the rough castings feed to the first station—at the right—where they are picked up by the hydraulic transfer mechanism and pushed into the fixture. Here the head is so loaded as to present the top face to the broach. In this position a second set of tools broaches the push rod side. As a safety measure the fixture is fitted with a set of three locators

(*Turn to page* 124, *please*)

Machine
Head Output



Standard mounting of Tantung bumper blades

By
Leonard
Westrate

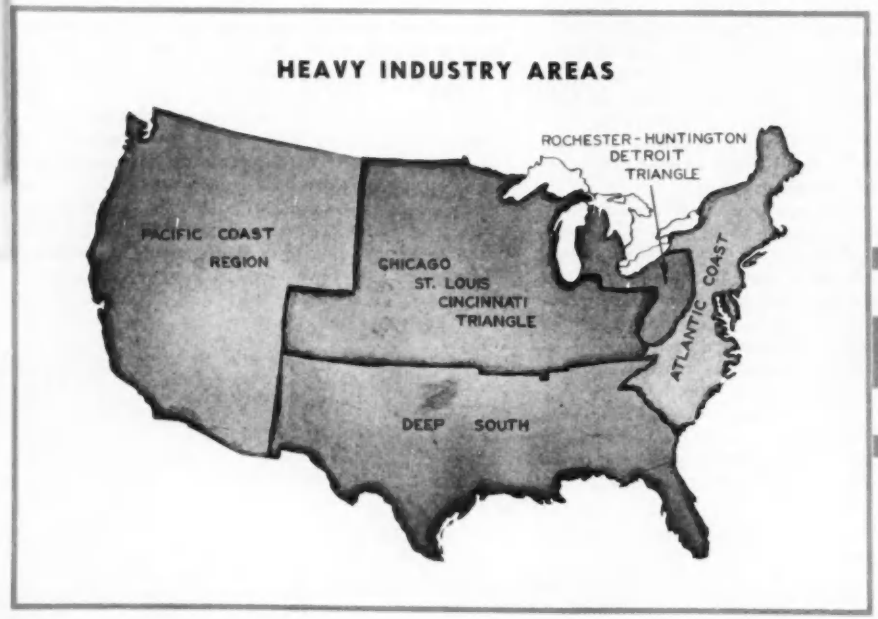
Thousands

As THE initial uncertainty arising from the stepped-up military defense program following the start of the Korean war dies down, the role of the automotive industries in the developing "guns and butter" economy is becoming increasingly clear. Now it looks very favorable for continued high production of vehicles through all the rest of this year and only a slight reduction in 1951, barring a serious turn in world events.

When Cadillac received its tank contract early in August, there was considerable speculation that it was the beginning of an all-out conversion program that might see automobile and truck production curtailed or cut off altogether. It now is apparent that nothing of the sort is to take place. As the military program is developing there is much evidence that the industrial mobilization planning carried on cooperatively since World War II between industry and the military is paying dividends.

As a result of this forward planning, the Ordnance Corps at the Detroit Tank Arsenal, procurement agency for military vehicles, was ready to move smoothly into Phase II of the program with "letter orders" to five prime contractors authorizing them to take immediate steps toward initial production of combat vehicles. The companies and the products they will build are: Cadillac Div. of General Motors, light tanks, to be built at Cleveland; Massey-Harris Co., Racine, Wis., howitzer motor carriages; Pacific Car & Foundry Co., Renton, Wash., gun motor carriages; International Harvester Co., track-laying type armored personnel carriers, to be built at Melrose Park, Ill., and American Car & Foundry Co., Berwick, Pa., howitzer motor carriages.

Location of these prime contractors illustrates the geographical dispersion that is an important part of military defense planning. The nation has been divided into five principal industrial areas comprising (1) the New England and Middle Atlantic states; (2) the Rochester, N. Y.-Huntington, W. Va.-Detroit triangle; (3) the Chicago-St. Louis-Cincinnati triangle; (4) the deep South, extending generally from Atlanta to Houston, and north to include Nashville and Memphis, and (5) the Pacific Coast area from Los Angeles to Seattle. Practically independent tank building economies are being established in these five regions for



# of Suppliers Needed

for Military Vehicle Orders

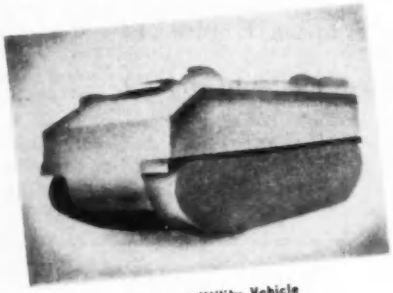
Outlook Is Favorable for Continued High Civilian Vehicle Production During Balance of Year With Only a Slight Reduction in 1951. Under Present Military Defense Program, Problems of Suppliers Seeking or Negotiating Subcontracts Are Greatly Simplified.

M-46 TANK SUPPLIERS

ENGINES	Continental Motors Corp., Muskegon, Mich.
AIR CLEANERS	The Vortex Mfg. Co., Claremont, Calif.
GAS TANKS	Superior Burner, Plymouth, Mich. Michiana Products Corp., Michigan City, Ind.
SHUT-OFF VALVES	General Controls Co., Glendale, Calif.
EXHAUST MUFFLERS	Maxim Silencer Co., Hartford, Conn.
ELECTRICAL ITEMS	Scintilla Magneto Division, Bendix Aviation Corp., Sidney, N. Y. Delco-Remy Division GMC, Anderson, Ind. Eclipse Pioneer Division, Bendix Aviation Corp., Teterboro, N. J. Guide Lamp Division GMC, Anderson, Ind.
INSTRUMENT PANEL GAUGES	A.C. Spark Plug Div., GMC, Flint, Mich. Stewart Warner Corp., Chicago, Ill.
WIRING HARNESS	Titeflex, Inc., Newark, N. J. Versatile Eng. & Mfg. Co., Dearborn, Mich. National Electric Mfg. Co., Niles, Mich.
TORSION BARS	Brad-Foote Gear Co., Chicago, Ill.
JUNCTION BOXES	Eclipse Pioneer Division, Bendix Aviation Corp., Teterboro, N. J. Packard Mfg., Indianapolis, Ind.
BLOWERS OIL COOLERS FAN ASSY.	Modine Mfg. Co., Racine, Wis. Sawyer-Bailey Co., Buffalo, N. Y. Miller Mfg. Co., Detroit, Mich.
TRANSMISSION FINAL DRIVES	Allison Division GMC, Indianapolis, Ind. Brad-Foote Gear Co., Chicago, Ill.
UNIVERSAL JOINTS	Mechanic Universal Joint Div., Borg-Warner Corp., Rockford, Ill.
TRACK & SUSPENSION	Kelsey Wheel Co., Detroit, Mich.
ROAD WHEELS	Motor Wheel Corp., Lansing, Mich.
TRACK SUPPORT WHEELS	The Budd Co., Philadelphia, Pa.
TRACK ASSY.	Goodyear Tire & Rubber Co., Akron, Ohio Firestone Tire & Rubber Co., Akron, Ohio
SHOCK ABSORBERS	Delco Products Div., GMC, Dayton, Ohio

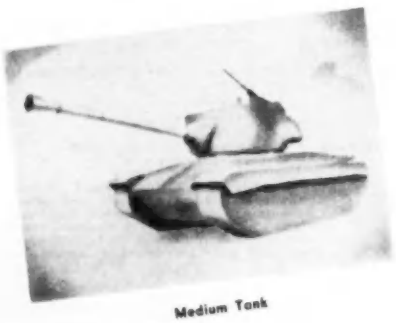
NOTE: The above list includes most of the principal suppliers of parts and components for the M-46 tank. Some of these units, such as the engines, consist of many individual parts which in turn are provided by other suppliers.

Twin 40-mm. Gun Motor Carriage



Armored Utility Vehicle

Light Tank



Medium Tank

Thousands of

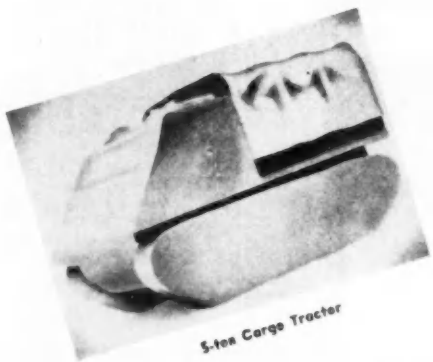
reasons of strategic security, economic dispersion over a wide area, and abatement of social and housing problems caused by migration of skilled workers.

Under the present military defense program, problems of suppliers seeking or negotiating subcontracts will be greatly simplified. In World War II, much of the subcontracting detail was handled by Ordnance, but now it is made the responsibility of the prime contractor. Companies seeking war work now need only to determine the prime contractor and then deal directly. The number of subcontractors on each of the vehicle contracts let thus far will total about 600 or

Modern Ordnance Automotive Vehicles that use Interchangeable Components shown on these two pages by courtesy of American Ordnance Association

COMMON

Engine	Air cleaner
Fuel pump	Magneto
Starting motor	Oil lines
Radiator	Instrument panel
Tachometer	Battery
Starter switch	Oil-pressure gauge
Fan	Driving blackout light
Primer	Auxiliary generator
Temperature gauge	Marker light
Starter relay	Speedometer
Generator	Ignition switch



5-ton Cargo Tractor

Suppliers Needed for Military Vehicle Orders

more for each job, which means thousands of suppliers will be needed for military vehicle orders alone.

While it is true that the nature of items supplied by subcontractors is identical or closely allied to those used by the automotive industries, the amount of material and labor to be required under the program as now envisioned will not be enough to affect automotive production materially. It is estimated that if and when all projects now planned are in full swing, the drain on steel and other important materials will fall somewhere between 10 and 15 per cent of the available supply. And with defense work being concentrated wherever possible in former war plants, as is the case with Cadillac which will operate in a former aircraft plant at Cleveland, the interference with production of cars and trucks should not affect production very much this year and only about 10 per cent next year.

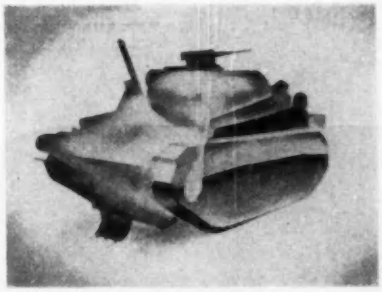
It is obvious now that it will be many months before any of the programs now getting started will be ready for production on a scale that will take sizable quantities of materials. Relatively few subcontractors have been lined up yet and it will take months after such contracts are awarded for the suppliers to get tooled and into production. GM, for example, has purchased the former Stinson aircraft plant near Detroit and will use it to produce auxiliary generators for the tanks to be built in Cleveland. Even though tooling is to start immediately, production will not get under way until next February. The plant will be operated by Detroit Diesel Engine Division.

International is planning to put up a new building at the Melrose Park operation in which it will produce

(*Turn to page* 122, *please*)

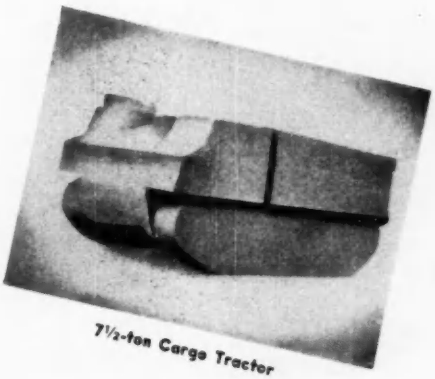
COMPONENTS

Circuit breaker
Tail light
Voltage regulator
Ammeter
Light switch
Headlight
Fuel lines
Dome light
Horn
Suspension
Tracks
Bogie wheels
Shock absorbers
Track support rollers
Final drive
Pintle
Heater
Universal joints
Radio
Winch
Transmission

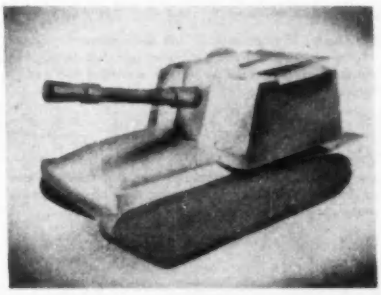


Tank-Recovery Vehicle

105-mm. Howitzer Motor Carriage



7½-ton Cargo Tractor



155-mm. Howitzer Motor Carriage

Making More Than 100,000

By Herbert Chase

VALVE guide bushings employed in Ford V-eight, 100 hp engines are gray iron permanent mold castings in the form of two-diameter stepped cylinders supplied by Eaton Mfg. Co. and by the Dotzel Co. There, the castings receive a 20-min heat-treatment at 1580 F and are slowly cooled to give them 141-168 Bhn before delivery to a compact but highly efficient machining department at the Ford Highland Park plant.

Although more than 100,000 bushings are machined per day, nearly all the machines are substantially standard units and perform conventional operations that could be paralleled in most production shops. Unusual, however, are some of the means for feeding work to machines automatically. Transfer from machine to machine is also automatic in many cases but belt conveyors of common types or chutes are the chief means employed.

In an earlier setup, a close approach to complete automation was employed for a time but experience showed that the advantages attained, especially in some automatic arrangements for transfer from machine to machine, were more than offset by operational difficulties and delays. This led to a reduction in some automatic handling features in favor of

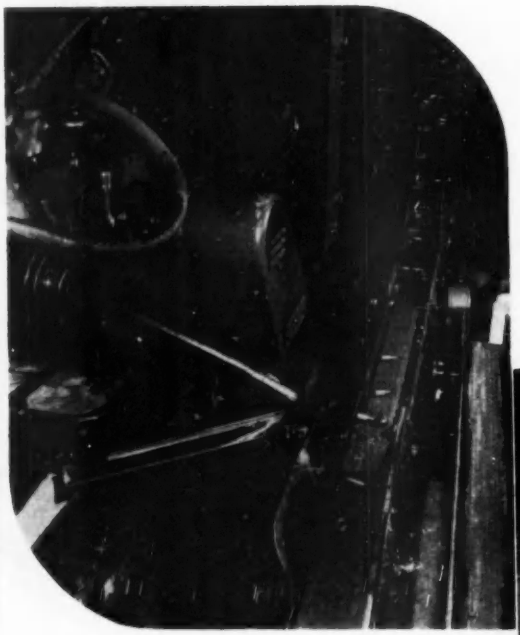


Fig. 1 (Above) End of one of the four primary grinding lines. Parts discharged from the chute, left, fall on the belt in foreground, are delivered by it to an elevating belt and go through a washer before other machining is done.

Fig. 2 (Right) Washed parts are discharged by an overhead belt into hoppers of this type via chute at right, are delivered into the twisted track, proper end forward, and are fed down a chute, top left corner, into an Acme automatic. Excess parts are returned to the hopper.

Valve Guide Bushings per Day

Iron Permanent Mold Castings Undergo Numerous Grinding, Screw Machine, and Boring Operations at Ford's Highland Park Plant. Much Handling is Automatic and Dimensions of Finished Workpieces Are Held to Remarkably Close Limits

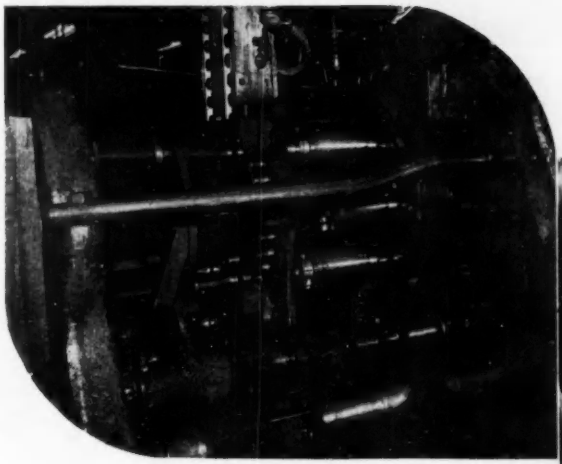


Fig. 3—Magazine employed to load a six-spindle Acme Gridley with six inlet valves guide castings at one time. An oil seal groove is turned in each work piece simultaneously.

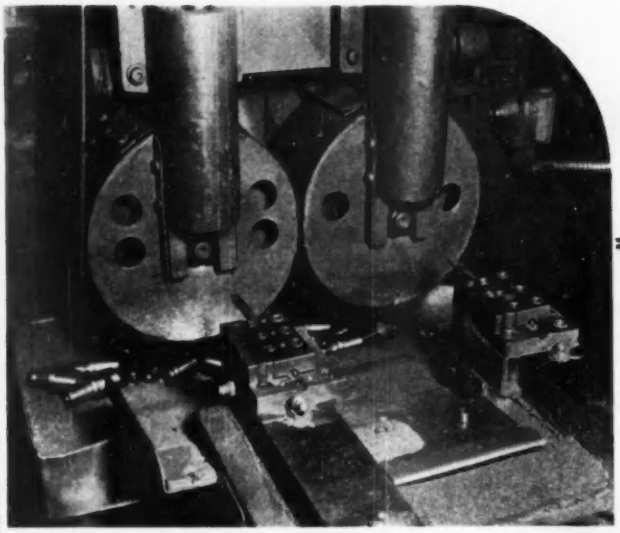
Fig. 4—Loading station of one of the Hoern & Dilts ten-spindle vertical machines in which initial boring of bushings holes is done. Workpieces are loaded and unloaded by hand in the diaphragm chucks.

simpler ones in which troubles and delays are minimized. In most cases, hopper and magazine feeds are still used at individual machines.

For the initial operation, castings received in tote boxes in lots of 10,000 are dumped into hoppers, each of which feeds one of the four duplicate primary grinding lines. In these lines consisting of four machines each, the castings are first fed between the wheels of two-disc grinders that remove metal from both ends to give correct overall length and then are passed in succession through a set of three Cincinnati centerless grinders working on the larger OD.

Removal of metal in the centerless machines amounts to 0.018 in. roughing, 0.005-0.006 in. semi-finishing and 0.001-0.002 in. in finishing. Between these machines, the pieces feed end-to-end automatically through tube-like channels and are not touched by hand except for occasional spot gaging of pieces to avoid taper and runout and to see that dimensional limits are held. These limits are ±0.005 in. on length and ±0.0005 in. on finished OD. Average rate through each line is 3000 pieces per hour.

At the discharge end of the four lines the workpieces slide down chutes onto the belt conveyor, Fig. 1. This belt discharges onto an elevating belt that carries the castings to a washer for removal of grit



Making 100,000 Valve Guides Daily

Fig. 5—Final machine boring is done in Ex-Cell-O machines such as this, having two hollow spindles through which the workpieces are fed automatically to a retracing stop. Solid carbide tools with brazed carbide tips are used.

and coolant. The washer discharges onto an overhead belt conveyor from which, in turn, the castings are shunted into hoppers, Fig. 2, each of which feeds one of the six-spindle Acme screw machines that perform the same function as a chucker but are fed through a hollow spindle.

Each of these hoppers (Fig. 2) has an automatic agitating and positioning device that feeds the workpieces into a twisted elevating channel proper end forward. This channel feeds into an inclined chute which, in turn, keeps the magazine of the machine filled. If feed into the twisted channel exceeds that needed to keep the inclined channel filled, excess pieces roll down another chute back into the hopper. Workpieces are fed one at a time into the hollow spindle at loading position.

In the six stations of these machines each casting is drilled end to end, the hole is reamed, lock and lifter grooves are turned, a spring seat is formed and clearance is cut. Drill diameter is 0.323 in. and as holes are 2.22 in. long, they are produced in $\frac{5}{8}$-in. steps (allowing for overlap) at five stations. Some drills have carbide tips and some are high speed steel. Drill feed is 0.0075 in. per rev. All turning is done by carbide tools and with spindles turning at 1500 rpm. Eccentricity of the reamed hole with respect to the ground OD may not exceed 0.002 in., even though subsequent precision boring is done.

At the end of each cycle, a workpiece is discharged into a chute and slides onto a belt, the total output per machine being 780 an hour. The belt taking castings away from these machines delivers half of them to finish centerless grinders and half to Acme Gridleys equipped with magazines such as are shown in Fig. 3. Feed to these magazines is from hoppers like those used on the other battery of Acmes. In the magazine, feed is down two channels and into a loop that brings the workpieces into line with spindles into which the pieces are pushed automatically six at a time by load-

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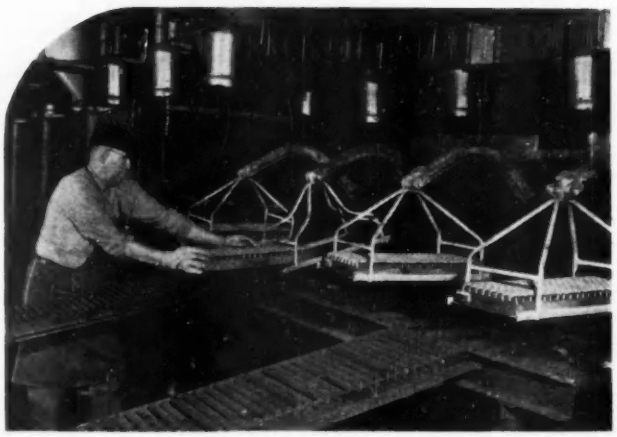


Fig. 6—Loading racks of fully machined valve guide bushings on carriers of the Stevens machine in which they are washed, phosphated and finally are dipped in oil that fills the pores of the coating.

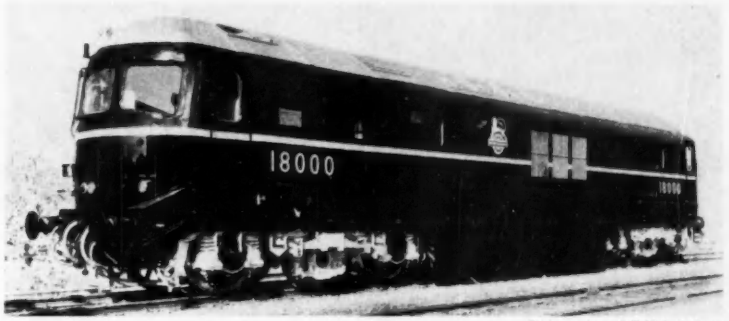


Photo courtesy of British Railways

British locomotive powered by Brown Bouveri gas turbine.

British *Experimenting with* Gas Turbine Locomotives

By W. F. Bradley

Special European Correspondent
for AUTOMOTIVE INDUSTRIES

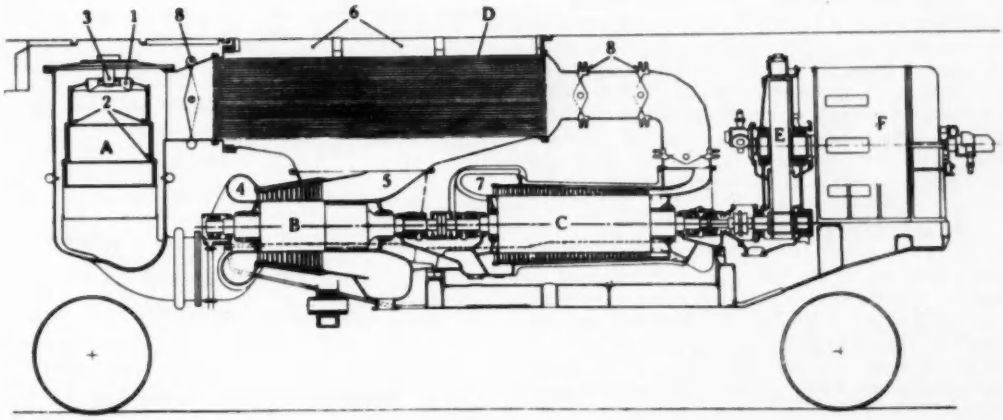
AN optimistic view of gas turbine locomotives is being taken by British Railways. Experimental runs are being made on the Great Western line with a British locomotive powered by a gas turbine built in Switzerland by the Brown, Bouveri Co. The locomotive is 63 ft long, weighs 115 tons, and attains a maximum speed of 90 mph. Maximum tractive effort is 31,500 lb from rest to 21 mph. One gas turbine drives an electric generator through reduction gearing, the current produced driving four traction motors, two mounted in each truck. The continuous net output of the turbine at the generator coupling is 2500 hp. Sufficient fuel is carried for a run of 250 miles. Starting on Diesel fuel, the turbine is switched to heavy fuel oil when warmed up. A Saurer Diesel engine drives an auxiliary generator that provides

(*Turn to page* 90, *please*)

Gas turbine unit used on British locomotive

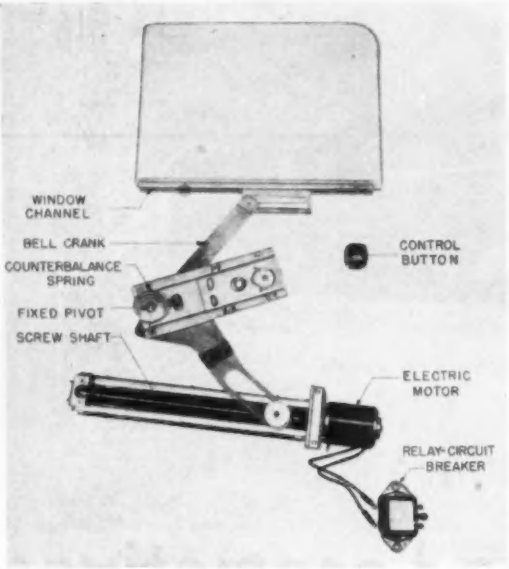
A Combustion chamber
B Gas turbine
C Air compressor
D Heat exchanger
E Generator reduction gears
F Generator

1 Combustion air swirl vanes
2 Secondary air inlets
3 Burner nozzle
4 Turbine inlet
5 Turbine exhaust
6 Exhaust louvres to atmosphere
7 Compressor air inlet
8 Expansion joints



All-Electric Window Lift

a New Chrysler Development



Component parts of Chrysler's electric window lift.

CHRYSLER CORP. has developed a new all-electric window lift; the first device of this type to be used on production passenger cars. It has been released initially for use on the Chrysler Imperial four-door sedan.

Each window lift unit has its own electric motor and functions as an independent, self-contained unit. Thus, the operation of any window is independent of the operating condition of any other window drive unit in the system. Sub-zero temperatures do not affect the satisfactory operation of this new electric window lift.

Basic components of the unit are a small reversing electric motor, a screw-and-nut drive, a bell crank, a combination relay-circuit breaker unit, and an operating switch. Each complete unit is housed within the door panel below its window, and a switch on the panel controls the raising and lowering of the window. The electric motor is mounted on the end of a steel frame and is directly connected to a screw shaft within the frame. A steel slider, guided by the v-ways of the frame, is attached to a nut which travels along the screw shaft. The contact surfaces of the slider and the end bearing of the screw shaft are lined with an anti-friction material.

Drive movement is transmitted to the bell crank by means of a pulley-like bearing which engages the slotted lower leg of the bell crank. This bearing is attached to the slider-nut assembly and incorporates a rubber bushing to provide flexibility between the drive unit and the window operating mechanism.

The bell crank is pivoted with respect to the inner door panel and the upper leg of the bell crank engages a slotted guide on the base of the window channel. A counterbalance spring at the pivot point assists the drive mechanism in raising the window.

Compression springs at each end of the screw shaft cushion the end travel of the nut. The springs provide a gradual deceleration of nut travel and oppose the locking torque of the screw and nut. Each spring seats against a fixed collar on the shaft so that, when the spring is compressed, only a small section of the shaft is under compression and the motor bearings are not subjected to extreme thrust loads. A small stainless steel washer between each spring and the nut aids in preventing jamming by reducing friction between the nut and coil spring assembly.

The frame and motor assembly is approximately 21½ in. long with a motor diameter of three in. All metal parts are either painted or cadmium plated for protection against corrosion. Protection against overload of the electrical system is provided by two 50-amp circuit breakers in the main feed lines and by the relay-circuit breaker unit in each door installation.

In a typical installation, the driver can operate all windows from a control panel on his door, and an individual control button is provided at each of the other windows. Each window can be raised or lowered

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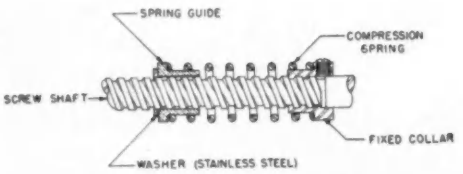

Compression spring assembly on screw shaft.

Determining Drag of an Automobile under Actual Road Conditions

By Sighard F. Hoerner

AERODYNAMIC drag of scale models of automobiles has often been measured in wind tunnels and recently studies have been made by placing actual vehicles in such tunnels. In this article the results of deceleration tests of a modern passenger car on the open road are presented and analyzed, indicating not only the aerodynamic drag under true conditions but also the mechanical and the tire drag.

The automobile tested is a 1948 Plymouth five-passenger coupe, standard version. This model has a notch back, open wheel housings, and the usual unfaired underside. Total weight of the vehicle (including equipment, gasoline and driver) during the road tests was 3600 lb. The tire size is 6.70—15 in., normally inflated to 26 psi pressure. The cowl ventilator and the windows were kept closed during decleration tests.

General test procedure was as follows: The vehicle was accelerated to a suitable speed; then taken out of gear and permitted to coast freely along a smoothly paved highway. The drag was found according to the principle that drag is equal to mass times deceleration. The speed was read from the standard speedometer and corrected according to a calibration against mile markers on a highway. The deceleration b was measured by means of a device mounted in front of the driver, near the windshield, indicating the amount of deceleration by the height of a column of fluid. The drag is

$$D = W_{eff}\frac{b}{g}$$

where $W_{eff} = W + \Delta W$

indicates the effective weight of the vehicle. The term ΔW denotes an additional effective weight equivalent to the moment of

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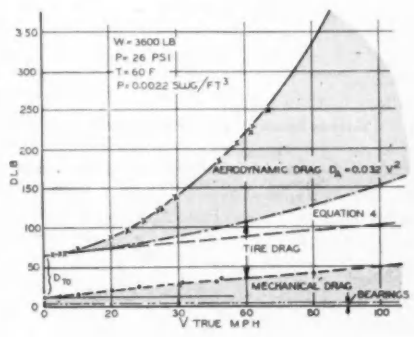


Fig. 1—The drag of a 1948 Plymouth five-passenger coupe, determined by deceleration tests on the road.

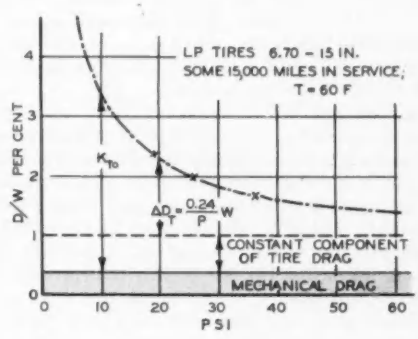


Fig. 2—The drag of the vehicle, determined by deceleration tests between 5 and 0 mph, depending upon inflation pressure of the tires.

Engine Design

THE recent American Petroleum Institute Lubricants Committee Meeting, held recently in Detroit, was the first meeting to which members of the automobile industry were invited. An outstanding feature was the opening address given by James H. Doolittle, Vice President, Shell Oil Co., who spoke mainly on higher octane ratings.

It was pointed out by Mr. Doolittle that in the three decades between 1919 and 1949, the cost, per barrel per day of throughput, of refining equipment increased 900 per cent and over-all processing expenses rose 260 per cent. Other costs such as exploration, production, transportation and distribution increased correspondingly. The average service station price, despite increased labor and material costs, was 25 per cent lower, ex tax, in 1949 than in 1919 and the octane quality was improved from 45 to 83. Even though the octane rating has risen two more numbers to 85 this year, the national average price of gasoline to motorists, exclusive of tax, during the month of May was actually lower than the average 1949 price. Historically, the trend has been for higher quality gasoline at lower prices and this is being accomplished despite the fact that each of the last octane numbers has been

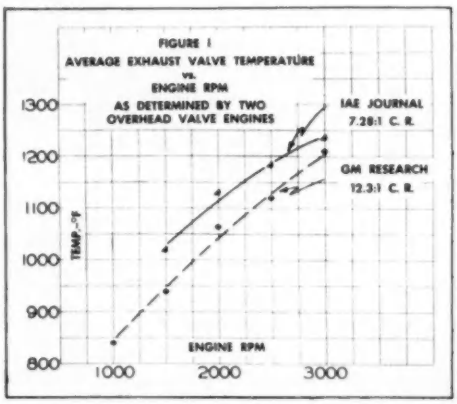
Engine Design and Its Relation to Fuels and Lubricants

By V. G. Raviolo

Ford Motor Co.

FOR the past year there has been an increasing amount of publicity given to unconventional engines, and there exists a group of ideas which have been gathering force and popularity because of repetition, rather than merit. Some proponents of the unconventional, whose imagination is uninhibited by experience or factual data, have a favorite assumption with which I would like to deal.

This assumption is that poppet valves are bad. A valve is expected to do three things—it must breathe adequately when it is open, must seal when it is closed, and should have adequate mechanical life. I think we can all accept the fact that the poppet valve breathes adequately, which is demonstrated by its record in racing cars and in aircraft engines. In addition, it is the only valve that has consistently demonstrated the ability to seal when it is closed. Engines with unconventional valves have been notoriously poor idlers. As for mechanical life, 80,000 miles in heavy duty truck operation on high quality valves is considered normal and 40,000 miles in passenger car operation with less expensive materials is also considered normal. In contrast, on engines equipped with unconventional valves, which were run experimentally, power curves had to be synthesized because we could not operate with one set of valves long enough to get a complete power curve. We would run over one-third of the speed range, change valves and rebuild the engine, run the next third of the speed range and then repeat the procedure for the last third.

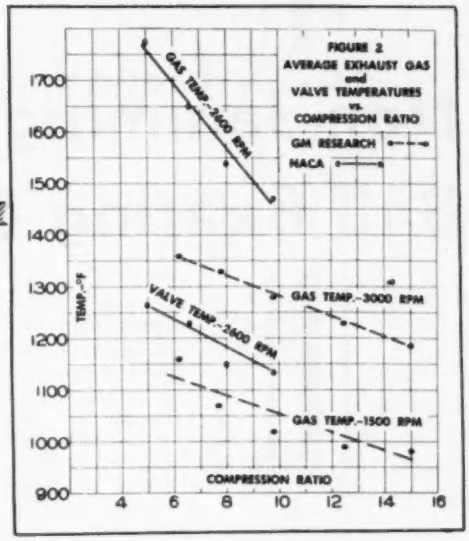


Problems

harder and more expensive to obtain than previously.

In respect to the problem of higher octane fuels, he stated, "But, to my mind, the first logical step toward the achievement of that goal, and one which will make its attainment easier and more practical, is for the petroleum and automobile industries to work together now to increase the efficiency of the conventional Otto cycle engine operating on today's premium grade economical fuels."

Among the papers read at the meeting were some of particular interest to those engaged in the automotive industries. Extracts of two are presented herewith.

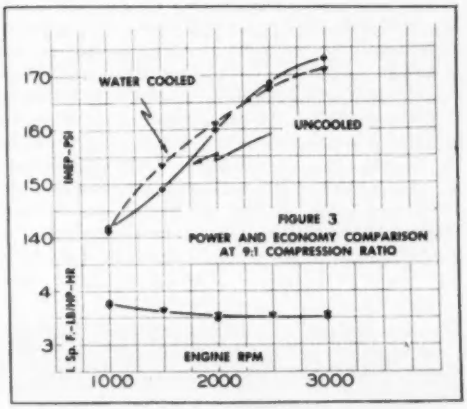


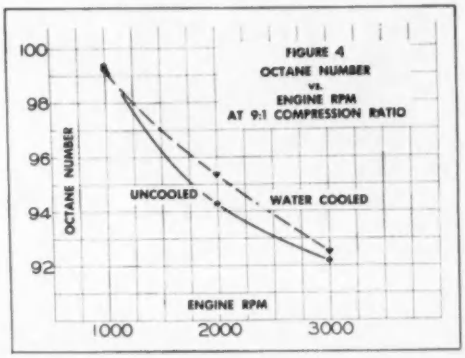
Where, then, is the failing of the poppet valve? Engineers who believe that poppet valves are undesirable dislike it because it is hot. The hot valve theoretically is supposed to heat up the charge and induce detonation and increase octane number requirement. It has been demonstrated that high octane numbers are required at low engine speed and, therefore, if there is to be any benefit through the medium of cooler exhaust valves, it should be effective at these low speeds.

However, from a plot of exhaust valve temperature versus engine speed as determined on two overhead valve engines, Fig. 1, it is apparent that the valve temperatures are lowest when engine speed is the lowest and octane requirement is the greatest. From data obtained by GM Research Laboratories and independently by the NACA, on exhaust valve temperatures and exhaust gas temperatures versus compression ratio, Fig. 2, it is believed that valve temperatures should become less and less of a problem as compression ratio is increased.

In order to leave no doubt about the value of exhaust valve cooling in relation to mechanical octane numbers, a water cooled exhaust valve was designed and built. This valve was installed on a single-cylinder overhead-valve engine and run at nine to one compression ratio. The design of this valve enabled the engine to be run in a normal manner at any engine speed with a continuously flowing supply of cooling water passing through the exhaust valve head. Flow rates from zero to 60 lb per hr were tried but no significant effect upon octane requirements could be detected, therefore, all remaining tests were carried out at an arbitrary water rate of 35 lb per hr. Although actual temperatures

(*Turn to page* 104, *please*)





Non-Jamming, Overrunning Ball Bearing Screw and Nut

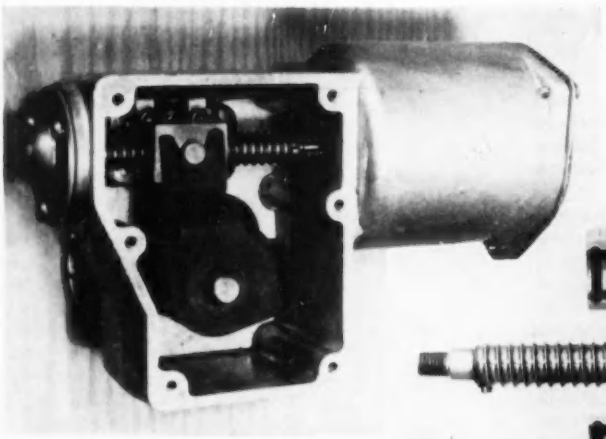
THE Eaton Manufacturing Co. has developed and patented a unique, highly efficient ball bearing screw and nut adaptable to devices requiring reciprocating motion, such as gear shifters, garage door openers, automobile window lifters, retractable landing gears, electronic actuators for remote controlling of pneumatic and hydraulic valves, electric switches, etc.

This is a power transmitting device having exceptionally low friction losses and high mechanical advantage. The screw can be operated by a relatively small reversible motor and is provided with means for accurately controlling the axial travel distance of the nut.

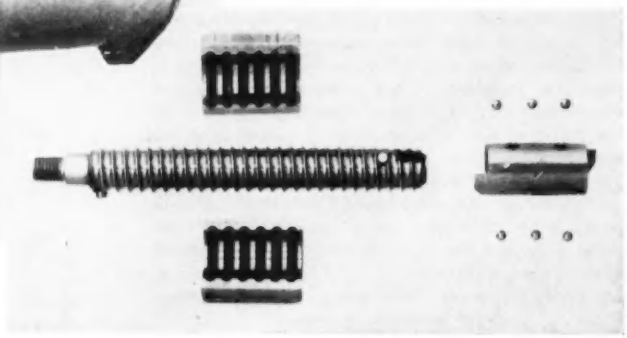
The screw has a thread groove which is semi-circular in cross section and of constant pitch throughout its length. The nut is made with equally spaced annular grooves of the same cross section as the thread of the screw. A retainer holds the balls in proper relationship with each other between the screw and nut. Openings in the retainer permit the balls to project radially inwardly and outwardly from the wall of the retainer.

An exclusive advantage of this design is that no jamming can occur when the nut reaches the limit of its travel in either direction. A suitable stop, located on the screw, contacts the retainer when it reaches the end of the screw, and causes it to rotate at the speed of rotation of the screw. When this takes place the balls rotate freely in the annular grooves in the nut in much the same manner as in an annular ball bearing and, obviously, without any tendency to produce axial motion. This feature permits rapid transverse motion and instantaneous stopping of the nut at the end of its travel without damage to the unit, and without the need for clutch or brake mechanisms.

With the parts made of hardened steel and highly finished, the efficiency of the Eaton ball bearing screw and nut is said to be about 98 per cent. This design makes possible the use of a drive motor of approximately 1/5 the hp that would be required with a conventional screw and nut to move the same load.



Eaton electric shift for a two-speed axle with cover removed showing the ball bearing screw and nut assembly.



The exploded view shows the parts in detail; the nut is split so as to show the circumferential grooves for the balls. The retainer has a total of six holes (four visible) which keep the balls in position. A greater number of balls can be used depending on the load requirement.

By
P. M.
Heldt

Increasing Popularity of Scooters in Italy

Lambretta motor scooter.

A REMARKABLE growth of motor-scooter production in Italy during the past few years was brought to light in a paper recently read before the Société des Ingénieurs de L'Automobile in Paris by Dr.-Ing. Giuseppe Lauro, general manager of the Innocenti Co. of Milan.

At the end of the war two Italian manufacturers, confronted with the problem of finding new products for their factories and providing employment for their workmen, saw in these small, two-wheeled vehicles—already in limited use in the U.S.A.—a possible solution to their difficulties. The two firms referred to are the Piaggio Co. of Pontedera, manufacturer of the Vespa, and the Innocenti Co. of Milan, manufacturer of the Lambretta motor scooter. Dr. Lauro stated that at the present time the entire Italian production of about

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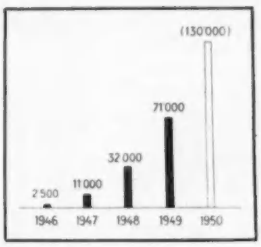
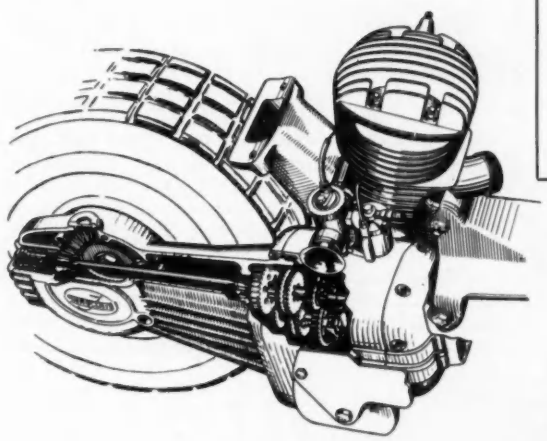
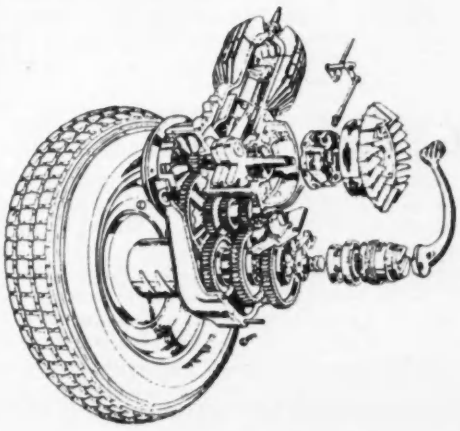


Motor scooter production in Italy.



Engine, transmission, and quill drive of Lambretta scooter.



Cutaway view of the Vespa scooter powerplant.

AIRBRIEFS

By ROBERT McLARREN

Air Power in Korea

The simple fact is that practically everything north of the 38th Parallel in Korea has been flattened by U. S. Air Force and Navy aircraft. This is the conclusion reached by the latest intelligence summary and it not only vindicates but is the most vocal possible praise of the job tactical air power has done in the war in Korea. After the expenditure of ten million rounds of .50-cal and 20 mm ammunition plus 13,000 aircraft rockets, fighters and light bombers have just about shot up everything from tanks on the front line to service stations on the Manchurian border, and fighter patrols are returning more and more often with their ammunition unexpended due to lack of suitable targets. This is the final answer to critics of the Lockheed F-80 jet fighter as a low-altitude strafing airplane in Korea.

But still the Red Koreans move forward—one of the mysteries of modern air power history, since the same tactics absolutely stalled Hitler's armies in the Spring of 1945. The difference lies in the fact that the former moves on handfuls of rice, while the latter moved on the internal combustion engine. One of the historic reversals of public attitudes was made recently by the Air Force in attempting to explain the phenomenon of the Red Korean Army and it sums up the frustration of our Air Force leaders. Maj. Gen. Gordon P. Saville, USAF Deputy Chief of Staff, said: "People expect too much of the Air Force if they want it to substitute for ground troops." (Which is just what the rabid air power believers have been preaching for a decade.) It would appear that Korea, at last, has brought realism to top USAF thinking—and a blessing it is.

Civil Air Controls

The CAA Aviation Development Advisory Committee has completed its report on the mobilization of the nation's 90,000 civil aircraft, 4237 airport operators, 4683 civil airports and 500,000 pilots; and CAA Administrator D. W. Rentzel has indicated his intention of placing those parts of the recommendations affecting the CAA into effect. Basis of the program is the issuance to all pilots of identification cards which are turned in upon completion of each flight, registration of all aircraft landing or taking off at airports, mandatory requirement of VHF radio equipment in all civil aircraft, and mandatory filing of flight plans. Stringent as these requirements may sound, in the historically "free and easy" field of private flying, they are essential in order that the military be able to recognize instantly *all* aircraft in the local area, from Cub to B-36, and isolate an enemy aircraft thereby. The new system would also hamper the use of civil aircraft by enemy agents or disloyal citizens for espionage or sabotage. Only the preliminary phase of the three-phase program will go into immediate effect with the more rigorous requirements coming only as a national emergency progresses. Aim of the plan is to put civil aviation to work in a future emergency, instead of simply grounding it for the duration, as in World War II.

Smaller Packages

A tribute to the over-enthusiasm of the lay press but an object lesson in the growing complexity of modern aircraft was the recent report in the British press that a new British jet bomber nearing completion, is larger than the Convair B-36. Engineers quickly perceived that someone was telling a tall tale. What had happened was that the new British jet bomber was announced as "twice as big" as the current Avro Lincoln piston-engine bomber, the Royal Air Force's standard long range bomber. Eager reporters immediately doubled its span of 120 ft and noted that 240 ft is greater than the 236-ft span of the B-36. But such is not the engineer's definition of "big" and the substance of the announcement was that the new bomber *weighed* twice as much as the Lincoln, which has a gross weight of 82,000 lb. The 165,000 lb jet bomber is actually about the same size as the Lincoln in dimensions, just as the Boeing B-47A Stratojet bomber is only slightly larger than the wartime Boeing B-17 bomber, yet weighs considerably more than twice as much and carries three times as much bomb load.

Commercial Airlift

One of the unpublicized surprises of the effect of the Korean affair on the economy is the fact that commercial airlines were in a far, far greater readiness for the emergency than was the military itself. A special group within the Continental Division of Military Air Transport Service was created immediately

(*Turn to page* 108, *please*)

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Close-up of Holley pressure distributor mounted on the Fageol engine.

Vacuum Controlled Distributor for Heavy Duty Engines

ELIMINATION of mechanical spark advance on ignition distributors for heavy duty engines has been accomplished with the introduction of the Holley pressure distributor recently developed by the Holley Carburetor Co., Detroit, Mich. It has been adopted as standard equipment on Twin Coach "44-S" buses powered by the Fageol FTC-210 engine. Holley original equipment on this engine, in addition to the distributor, includes the 855-FFG carburetor and Centri-Vac governor.

The pressure distributor consists of four basic elements: diaphragm assembly, breaker plate assembly, distributor shaft and cam assembly, and base. For Centri-Vac installations the distributor base houses the governor rotor unit as well.

The full pressure distributor is unique in its response to both wide open throttle and road load spark advance requirements of the engine without centrifugal advance mechanism. Instead, pressures which exist within the carburetor are utilized. The pressure which varies as the engine speed is derived from the venturi, and that which varies with the load is obtained from the throttle plate area. By balancing these pressures one against the other, through metering orifices, the net pressure is considered a function of the spark advance requirements of the engine.

This pressure is transmitted to a single diaphragm linked to the distributor breaker plate. The hub of the breaker plate is carried on the outside of the upper distributor shaft bushing. The force transmitted to the plate from the diaphragm assembly causes it to rotate, extending two calibrating springs and thus advancing spark timing.

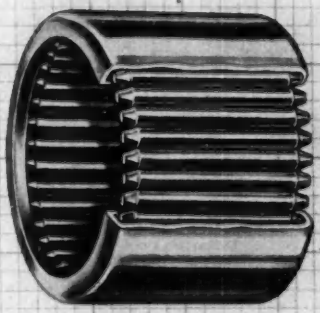
One of the advantages claimed for this design is the elimination of backlash and possible eccentricity of the cam since the distributor shaft does not rotate with respect to the cam. Absence of centrifugal advance mechanism also greatly reduces the polar moment of inertia of the rotating assembly thus making torsional vibration absorbers unnecessary even in installations requiring very long shafts.

The distributor has been simplified for service and maintenance. The breaker arm and bracket assembly is designed as a complete factory assembled unit consisting of the breaker arm and the stationary breaker point, including the breaker arm pivot pin. Unit replacement of this assembly insures alignment of breaker points and includes a new breaker arm pivot pin not readily replaceable on conventional distributors. Breaker points can be adjusted by using a notch in the adjustable breaker point bracket, corresponding with a similar notch in a hole in the breaker plate. The blade of a screw-driver will fit in the two notches to act as a lever. Thus, the stationary breaker point may be precisely moved with one hand while the clamping screw is loosened or tightened with the other.

An additional feature is that the distributor can be adjusted while on test machines throughout the entire spark advance curve, without disassembly.

save money with

TORRINGTON NEEDLE BEARINGS



You can save in first cost—Needle Bearings are only slightly more expensive than plain bearings and cost much less than conventional ball or roller bearings.

You can save in design — only three elements are needed, a plain bore housing, a hardened and ground shaft and the Needle Bearing.

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Secure these savings *now* by asking a Torrington engineer to help you adapt anti-friction Needle Bearings to your products.

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Fast, Accurate Boring Operations

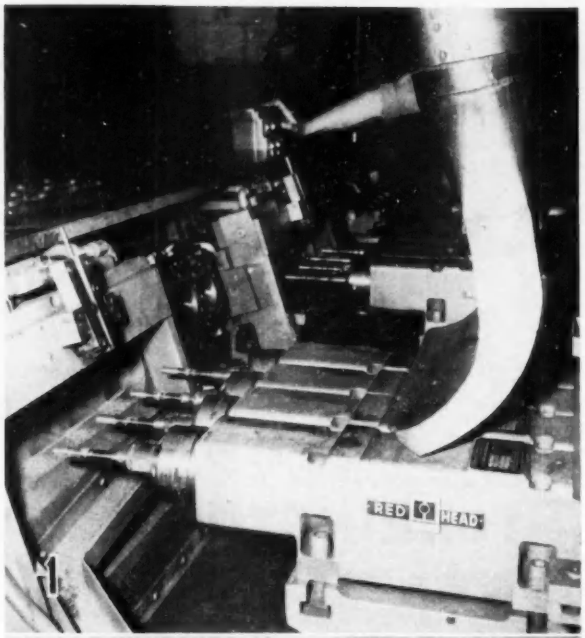
on Cadillac Cylinder Heads

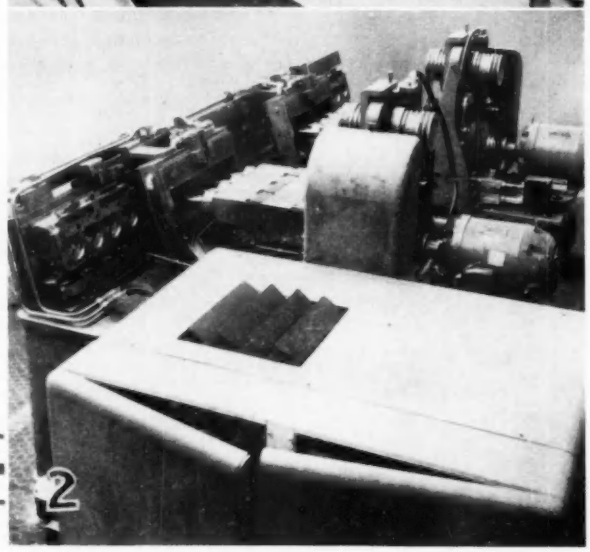
THE virtually unlimited possibilities of the transfer type machine are well illustrated in the five-station precision boring machine installed by Cadillac for a group of related operations on the cylinder head. As shown here, the machine is composed of two single way type, Model 231 Heald Bore-Matic units arranged side by side with a removable spanner section between. Special right- and left-hand fixture supports are attached to these leg units for applying the five-station conveyor mechanism.

The conveyor is of hydraulic type, arranged to transfer the cylinder heads in sequence from the loading station through two working stations, an idle station and an unloading station. Each of the two working stations performs the same operations on alternate valve openings. At the present writing the machine has a productivity of 50 heads an hour.

Specifically, the operation consists of boring eight valve guide holes, finishing the counterbores below the valve seats, and generating eight valve seats from angular cross feed slides.

Damped quills are applied in this machine to insure better finish and to prolong tool life. Work is carried through automatically by means of a draw bar actuated by a piston and cylinder. Because of the simultaneous boring of valve guide holes and valve seats, the concentricity and alignment of valve seats so important in this high efficiency engine, are maintained unfailingly.





1. —*This is the Heald Bore-Matic transfer machine as installed with fixtures in place and with exhaust ducts for chip removal in position. The control board for the machine may be seen in the background.*

2. —*View of Cadillac cylinder head precision-boring machine before installation and with fixtures and accessories removed to show positioning of the work.*

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Write for bulletin No. 409 describing these proven controls. You can depend upon their rugged construction, design, and our many years' experience in this field. If you are a buyer of engines, specify SYNCHRO-START to your engine manufacturer. He will be glad to supply you with the controls best suited to meet your demand.

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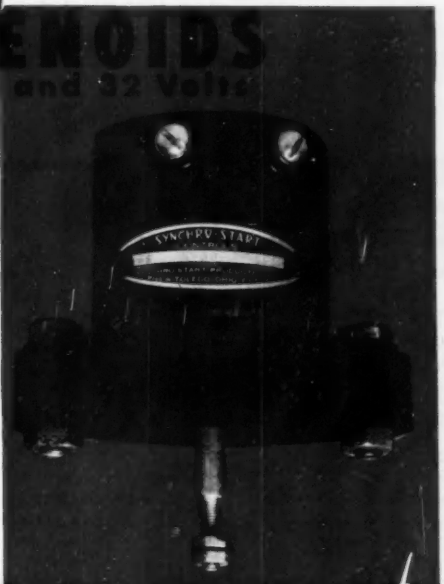
Write for bulletin No. 410 describing this rugged control or for our latest catalog covering our complete line of SYNCHRO-START Automatic Controls which have been in use for the past seventeen years. You can't go wrong with SYNCHRO-START.



SYNCHRO-START PRODUCTS, INC.

Automatic Engine Control Equipment

Publications AVAILABLE

New Industrial Literature listed in this department is obtainable by subscribers through the Editorial Department of AUTOMOTIVE INDUSTRIES. In making requests please be sure to give the NUMBER of the item concerning the publication desired, your name and address, company connection and title.

L-63 Tungsten and Molybdenum

Fansteel Metallurgical Corp.—A new 24-page illustrated booklet on tungsten and molybdenum is available. In text, illustrations and tables, the booklet covers metallurgy-physical, mechanical and chemical properties, uses and applications, fabricating techniues and available forms.

L-64 Cutting and Welding Apparatus

Alexander Milburn, Inc.—A new catalog is available which describes and illustrates the company's entire line of oxy-acetylene cutting and welding apparatus, regulators for oxygen, acetylene and other gases; accessories and supplies and portable carbide lights.

L-65 Drill Heads

U. S. Drill Head Co.—A new 28-page catalog includes illustrations and full descriptions of drill heads containing various numbers of spindles for reaming, facing, tapping, threading, etc. Cross-section engineering drawings give full details regarding the drill heads and the catalog also includes installation photographs.

L-66 Roughness Rating Methods

Physicists Research Co.—A new bulletin has been announced on surface-roughness rating by "feel" and by visual comparison. The publication discusses how differences in shape, surface pattern, color and reflectivity can affect surface comparisons. The effects of the roughness contour on apparent roughness as judged by eye, are also shown.

L-67 Batch-Type Furnaces

Holcroft and Company—A 4-page illustrated folder on the new batch-type furnaces for controlled atmosphere heat treating is available. It discusses the completely automatic cycle of the batch-type furnace. Drawings covering the cycle and suggestions on how the furnace can fit into production lines, are included.

L-68 Phenolic Resins

Bakelite Div., Union Carbide & Carbon Corp.—A new booklet describes the use of Bakelite phenolic resins for producing molds and cores by the Croning, or "C" method. The booklet includes descriptive photographs and recommendations for producing patterns, molds and cores.

L-69 Compressors

Ingersoll-Rand Co.—The company is offering a new bulletin describing their "T" Series Stationary Air Compressors. The bulletin shows various sizes and models and gives cross-sectional views, engineering data, sizes and dimensions.

L-70 Saran Lined Steel Pipes

The Dow Chemical Co.—A new catalog has been announced covering Saran lined steel pipes, fittings and valves. Photographs, cross-section and dimensional drawings are included in the catalog.

L-71 Spun End Tubes

Wolverine Tube Div.—A new brochure giving information about the

(*Turn to page* 130, *please*)

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Designing gaskets for low-cost flanges

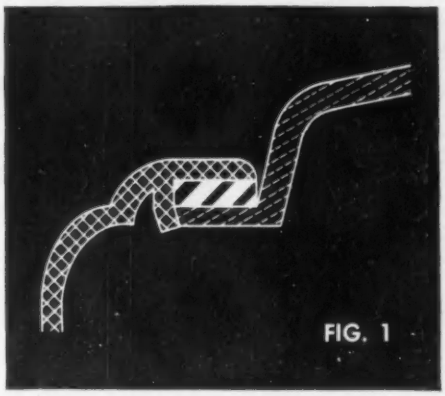
FIG. 1

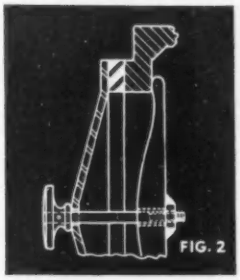
FIG. 2

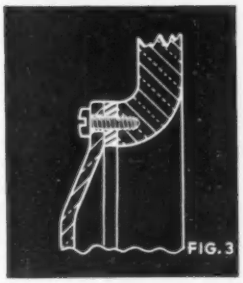
FIG. 3

Effective sealing of stamped, molded, and other low-cost flange designs requires an unusual combination of gasket properties. These gaskets must be soft enough to seal irregular surfaces without tending to buckle thin-section flanges, yet firm enough to hold a lasting, leakproof seal.

This seemingly contradictory combination of properties is found in Armstrong's Cork-and-Rubber Compositions. Cork-and-rubber combines cork particles and synthetic rubber in controlled proportions to provide the right degree of compressibility for each of these applications. Furthermore, even the soft cork-and-rubber compositions are impervious. They also have a solvent resistance that is comparable to straight rubber.

In Figure 1, for example, a Neoprene-base cork-and-rubber provides a weather-tight seal on the automotive taillight assembly shown. This material is soft enough to compress when plastic lens and die-cast rim are crimped together, yet it is firm enough to provide a permanent seal in this pre-assembled unit.

A Buna N-base cork-and-rubber, likewise, provides an effective seal for the stamped diesel hand hole cover in Figure 2. Its softness permits economical light pressure assembly without buckling the cover, yet it retains its sealing efficiency despite frequent opening and closing of the cover.

Cork-and-rubber does the same kind of job on the waterproof electric motor housing in Figure 3. It seals surface irregularities in both unmachined flange and stamped cover, yet stands up under exposure to lubricating oils and sea-water.

Sealing cost-cutting flanges is but one of the problem jobs solved by Armstrong's Cork-and-Rubber. Chances are, its unique properties can also help you. We suggest that you contact your Armstrong representative today.

New Gasket Handbook now available

You'll find useful application and specification data in the new 20-page edition of "Armstrong's Gasket Materials." It contains up-to-date information on straight synthetic rubber, cork-and-synthetic-rubber, and cork compositions, together with sections on friction drive materials and DK-153 adhesive-backed tape.

This booklet includes technical discussions covering many important factors that influence modern joint and gasket design. These points are summarized in a convenient list for use in checking over your design.

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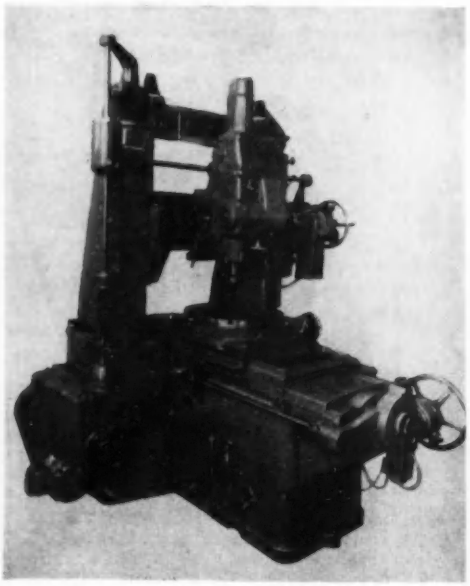
M-36—Precision Jig Borer

A new addition to the line of Swiss precision jig borers carried by the Hauser Machine Tool Corp., Manhasset, N. Y., is the Hauser type 5 jig borer. A direct result of the demands of the automotive and aircraft industries for a machine of larger capacity, yet retaining the accuracy of the Hauser type 4C jig borer, the type 5 is designed for maximum rigidity without excessive weight. Entire unit weighs 7000 lb. All lead screws are precision ground from special stabilized steel, then optically checked for minor pitch errors which are compensated for by corrector bars. Guaranteed accuracy of slide locations is 0.0002 in. and settings are read to 0.0001 in. on vernier scales. Maximum boring capacity is 9 in. and vertical travel of the boring spindle is 9 in.

Individual electric motor drives for table motion, vertical movement of the transverse slide and transverse movement of the boring head are designed to increase the operator's productivity.

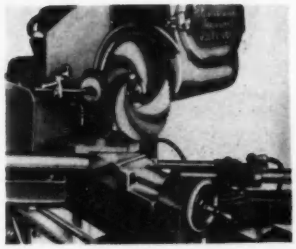
Hauser type 5 jig borers are now coming off the production lines of Henri Hauser, S. A. Bienne, Switzerland, with most of the factory's production destined for delivery to U. S. industry, the company reports.



Hauser Type 5 jig borer

M-37—Circular Sawing Machine

Fast and accurate square or angular cutting off of ferrous or nonferrous materials up to 3 in. round or square is effected on the new Model No. 00-G circular sawing machine manufactured by the Motch & Merryweather Machinery Co., Cleveland, Ohio. Angular cutting up to 45 deg, said to be available for the first time on circular sawing machines, is possible by inserting clamping jaws of the desired angle and moving the supporting stock conveyor. Where it is not convenient to move the stock conveyor, the Model No. 00-G circular sawing machine can be mounted on a swivel base. This allows the machine to be swiveled to the desired cutoff angle.



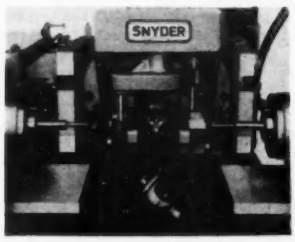
Motch & Merryweather circular sawing machine, Model No. 00-G

Stock can be fed into the machine either manually or by an automatically operated air-powered stock feeder for standard lengths up to 24 in. with additional lengths available for special applications. Special gaging and holding fixtures for odd shaped extrusions and intricate parts can be adapted to the machine. Gravity feed of the one-piece saw head is by hydraulic flow control valve. Saw blade is driven by the direct drive geared saw head. Changes of sawing speeds are made by means of pick-off gears.

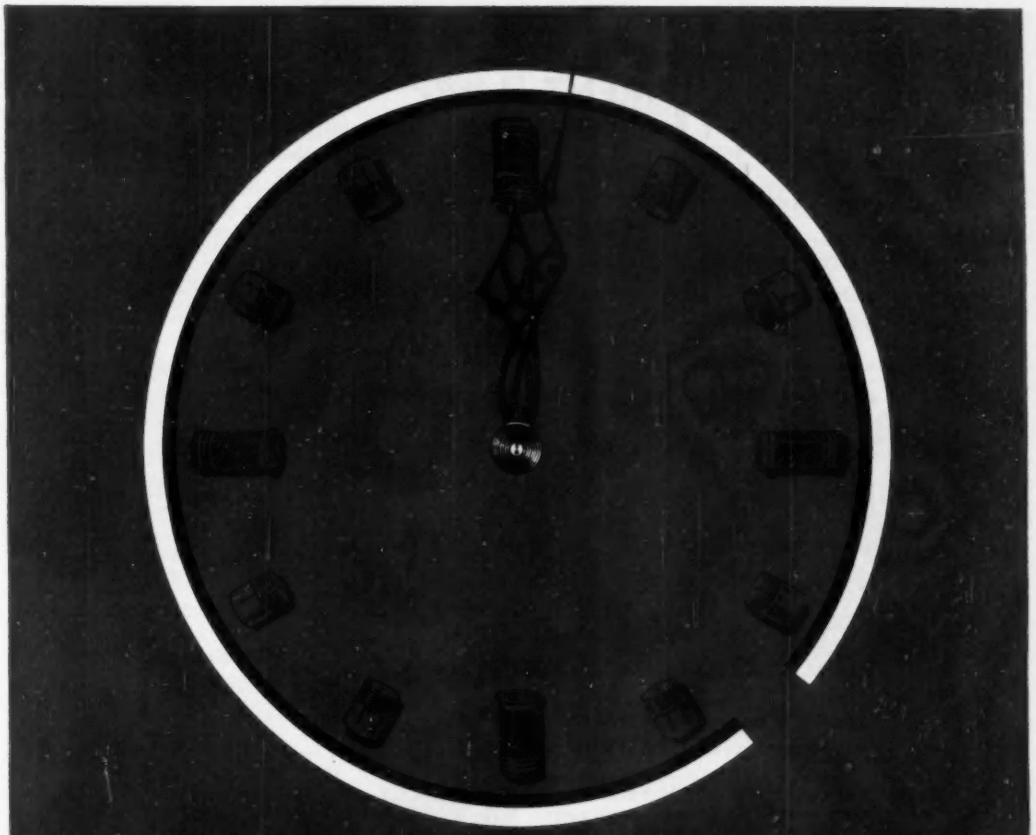
M-38—Gear Seat Milling Machine

For rough or finish milling two spherical gear seats inside a differential gear case, a special high-production machine has been built by Snyder Tool & Engineering Co., Detroit, Mich.

When the workpiece, which is malleable iron, is located in the fixture, it is automatically clamped by a hydraulic power clamp and automatically indexed



Snyder special milling machine



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CYLINDER SLEEVES

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into position for milling one side and then the other.

The cutter is carbide and is held in a yoke on a stationary bracket; the part is loaded over the cutter and driving arbors engage the cutter automatically. Tool speed is 80 fpm; feed 3.5 ipm; and stroke 4 in. The spindle is powered by a 3 hp. motor, and is driven through belts and helical gears in the head. Tools are quickly changed by removing two screws in the carrier horn.

Coolant is supplied from a separately mounted 42 gal tank provided with a chip tray. Lubrication is automatic. Base and column are welded steel construction, thoroughly braced and normalized.

Work cycle, fully automatic, is 40 sec, giving production to 90 pcs an hr at 100 per cent efficiency and 72 pcs at 80 per cent. The machine is 62½ in. high; floor space required, 71½ in. by 109 in. Built from standard components, the machine can be readily adapted to processing a wide range of similar parts.

Here's a Tip for Stalled Transmission Designers
Thousands of design engineers have discovered that ROCKFORD CLUTCHES fit compactly into product designs because they deliver maximum torque with minimum bulk and weight. The extensive ROCKFORD line offers you the widest selection of clutch types, sizes and capacities. An experienced ROCKFORD CLUTCH engineer will be glad to make recommendations that will help solve your transmission design problems by meeting your clutch needs exactly. Let him suggest how you can improve that NEW design.
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ROCKFORD CLUTCH DIVISION
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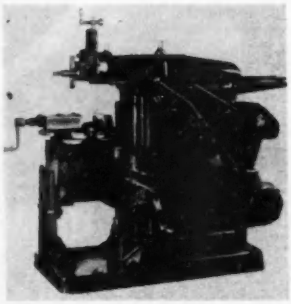
315 Catherine Street, Rockford, Illinois

M-39—High Speed Shaping Machine

A high-speed floor model shaping machine with 14-in. stroke and 26-in. ram and four speeds varying from 27 to 140 strokes per min is available through DCNT Sales Corp., New York, N. Y.

The ram slides are of V section, with large bearing areas and cross section to resist cutting stresses. Table is of box-section with machined T slots and a strong adjustable table support. Adjustable gibs and felt wipers are fitted to all slides.



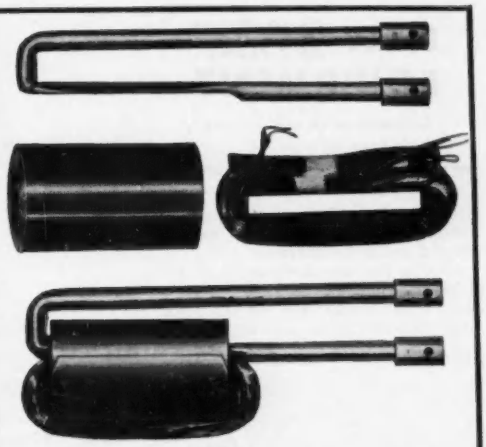
Brook 14 in. high speed shaping machine, available through DCMT Sales Corp.

The automatic horizontal feed motion is arranged to give four variations of feed per ram stroke. The drive is from a self-contained motor, mounted on an adjustable stool, and is transmitted by three V belts through a matrix multiple-disk friction clutch to a totally enclosed four-speed box. Oil-immersed cast steel gears slide on multi-splined shafts. The bull gear has helical teeth to prevent chatter.

M-40—Collet Chuck and Bar Feed

Offered as standard equipment by Warner & Swasey, Cleveland, Ohio, for their No. 3, 4 and 5 turret lathes, a hydraulic collet chuck and bar feed design involves a bar feed stand, a chuck-

HEAVY, LESS EFFICIENT and slower to assemble, was the original Weller Soldering Gun composed of the parts shown. Compare these with the fewer parts at right in the new Gun, and you'll readily see why the new streamlined Weller is so popular.



THE NEW WELLER SOLDERING GUN handles 250 watts; heats, ready for use, in five seconds; has longer range to get into the tight spots, and is equipped with spot light. Uses current only when trigger is operated. It is assembled faster. Requires no bolts or nuts. The ⅛" Revere Copper Rod that replaces the secondary coil in the transformer is sheared, flattened, and bent at right angles in a 200-ton press in a single operation.

COPPER TREATS YOUR PRODUCT BETTER WHEN YOU

Control Your Temper

Revere Copper Rod replaces Secondary Coil in Soldering Gun Transformer . . . reduces number of parts, makes for a speedier, more efficient assembly . . . also makes possible a lighter, more compact unit of increased capacity.

WHEN the Weller Manufacturing Company, Easton, Pa., was completing the development of its new electric soldering gun, they were confronted with this problem: The ⅛" Revere Copper Rod used to replace the secondary coil in the transformer had to maintain its rigidity yet be sufficiently soft so that during the shearing, coining, and bending operations there would be no breaking or splitting of the rod.

Revere's Technical Advisory Service recommended a certain temper copper rod. It was discovered that Weller was getting a twist in the rod when it was installed in the assembled gun. Other tempers were tried and tested. Then a copper rod of a slightly harder temper than the first was recommended. That was it! Proper temper was the key. Proper temper was also the key to the .291 dia. copper rod used for the Soldering tip itself. For this, too, had to retain its rigidity and yet remain soft enough to be coined, punched, and formed without fracture.

"In addition to being extremely helpful in arriving at the proper tempers, Revere also recommended that we specify our rod in multiple lengths, and thus save considerably on scrap. They were also helpful in solving the problem of attaching the brass sleeve to the secondary rod in our Soldering Gun," the Weller Manufacturing Company tells us.

So you see, Revere's interest in your problem does not stop with the recommendation of its products. Perhaps Revere can help you. Why not take your current problem to the nearest Revere Sales Office and see?

REVERE

COPPER AND BRASS INCORPORATED

Founded by Paul Revere in 1801

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Mills: Baltimore, Md.; Chicago and Clinton, Ill.; Detroit, Mich.; Los Angeles and Riverside, Calif.; New Bedford, Mass.; Rome, N. Y. Sales Offices in Principal Cities, Distributors Everywhere.

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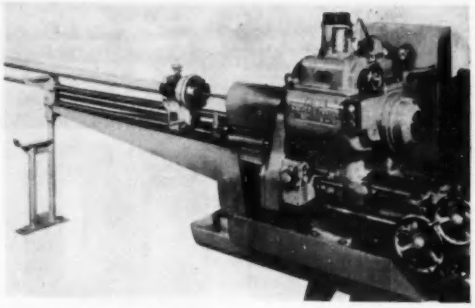

Warner & Swasey hydraulic collet chuck and bar feed

type bar feed head, a control valve with a single lever for all functions, and associated hydraulic equipment.

After a bar has been loaded in the stand and the bar chuck jaws are properly set, a forward pull on the headstock-mounted control lever actuates the hydraulic mechanism to advance the bar for a distance determined by the position of stroke-adjusting nuts against a scale.

When the lever is pushed away from the operator to close the collet hydraulically and reverse the pusher head travel, the bar feed head strips back off the stock. The lever then automatically returns to a central, neutral position.

The bar feed chuck jaws are manually adjusted with chuck wrench for the proper degree of gripping, and the collet is adjusted in the usual manner. A direct-reading pressure gage atop the headstock indicates the degree of collet tightness to aid in set-up.

The unit provides a fast-acting, positive bar feed under fingertip control to speed the production cycle. The collet chuck and bar feed is offered in two sizes—one suited to the No. 3 or No. 4 machine, the second applicable to the No. 5 turret lathe.

1939 First Sealed Cooling Systems for Production Line Cars
1940 Three More Went Modern
1941 Two " " "
1942 Two " " "
1945 One " " "
1946 Two " " "
1949 One " " "
1950 One " "
In 11 Years What Thermostat Modernized in Step with Engineering Advances in New Cars?
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DV
Thermostats satisfy all demands of modern cooling Systems.
THE DOLE VALVE COMPANY
1901-1941 Carroll Avenue • Chicago 12, Illinois
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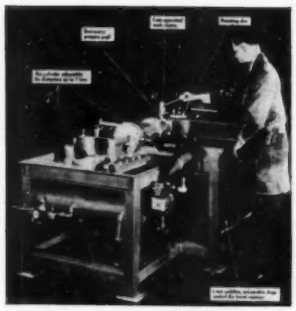
• Also manufacturers of Copper Tubing Couplings . . . Aircraft Valves and Fittings . . . Brass Screw Machine Products.

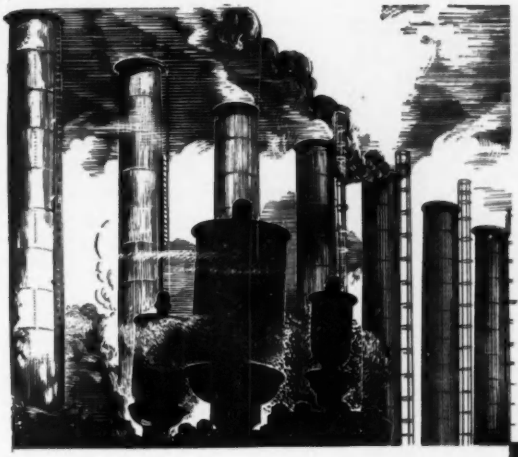
M-41—Rotary-Fixture Bending Machine

Announced by Pines Engineering Co., Aurora, Ill., is a new rotary-fixture machine for bending irregular shapes or true radii in tubing, bars, extrusions or roll-formed sections up to 8-in. wide. The new unit is designed to speed handling of a wide range of bending work commonly required in the automotive, aircraft, etc., fields.



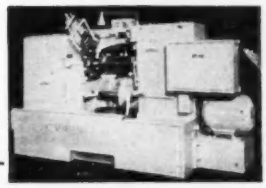
Pines rotary-fixture machine for bending irregular shapes or true radii

The bender employs a horizontal stationary pressure pad of either steel or bronze construction which is air oper-

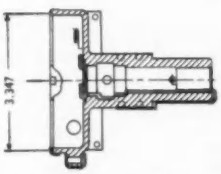


THERE'S plenty of business in sight for the manufacturer who can keep quality up and prices down.

That's no small order! Unless you are willing to gamble on lower *wages*, lower *taxes*, lower *material cost*, and lower *selling expense*, the only answer lies in more efficient production. That calls for *genuinely* modern production equipment.



NEW BRITAIN MODEL 61 AUTOMATIC



This piece is turned out on two New Britain six spindle automatics equipped with magazine and work inserters which load the die cast aluminum pieces.

The first machine performs nine operations and turns out 736.7 pieces an hour. The use of a shave tool maintains very close tolerance on the outside diameters of the stem, with concentricity held within two thousandths.

The second machine matches the production of the first almost exactly, performing thirteen operations and delivering 735.1 finished pieces hourly. On this machine also extreme accuracy is maintained in finish reaming operations on both inside diameters.

NEW BRITAIN

Automatics

THE NEW BRITAIN MACHINE COMPANY
NEW BRITAIN-GRIDLEY MACHINE DIVISION
NEW BRITAIN, CONNECTICUT

550HE1

MULTIPLE SPINDLE AUTOMATIC SCREW AND CHUCKING MACHINES • SINGLE AND DOUBLE END PRECISION STRAIGHT AND CONTOUR BORING MACHINES • LUCAS PRECISION HORIZONTAL BORING, DRILLING AND MILLING MACHINES

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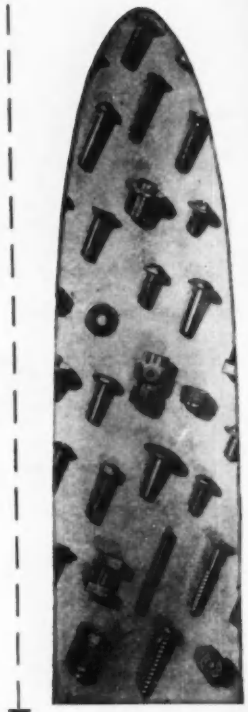

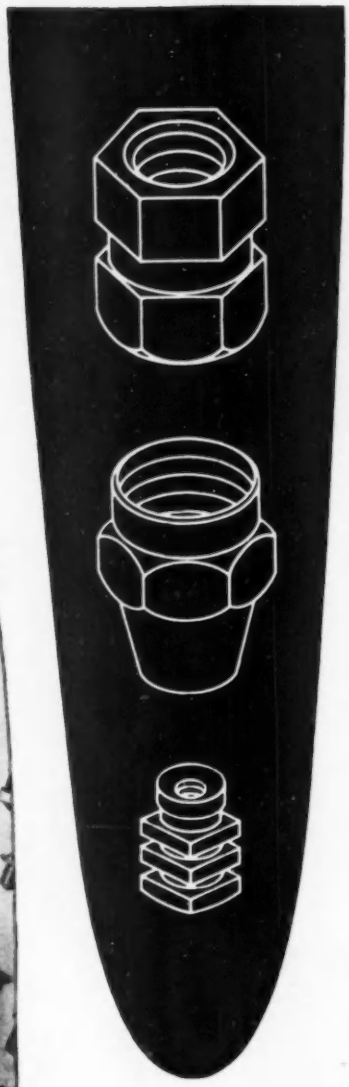

Slotted or Phillips head machine screws, wood screws, stove bolts, tapping screws, special headed products; nuts, rivets, chaplets, wire forms, screw machine products . . . in steel, stainless steel, copper, brass, bronze, everdur, nickel, nickel silver, monel, aluminum . . .

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BLAKE & JOHNSON Fastenings

THE BLAKE & JOHNSON COMPANY, WATERVILLE 48, CONN.

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ated against a rotating type die head. The die head is mounted on a heavy vertical spindle which is gear driven by 7½ hp motor. A variable speed motor provides die head speed variations. Limit switches and adjustable dogs control the degree of rotation of the die head during the working cycle and are easy to set to provide the required angle of bends. Convenient electrical push buttons permit starting, stopping, or reversing the cycle at any point. A lever-operated cam work-clamp applies pressure for holding the stock. Adjustable slide mounting of the air cylinder provides capacity for handling bends up to 7 ft in diam. Change-overs in tooling set-up from one part to another are said to be made by one man in 30 min.

The stationary pressure pad feature of the machine avoids single point contact on work pieces, acts as an ironing shoe, and assures smooth, wrinkle-free bends.

To meet varied pressure requirements, the unit is designed to accommodate either a 6-in. or an 8-in. air cylinder. A stroke of 12-in. is standard. Pressure tank, pressure regulator and lubricator are standard equipment.

The operating control of the die head, which can be set to continue forward after a bend is made, or reversed to starting position, saves time and assures an easy means of controlling the accuracy of bends on production runs. The reversible feature is also useful and saves time on small lot work when a straightening operation may be required.

Open table construction provides ready access to the limit switches, adjustable dogs, gear box, motor and bearings. Overall dimension of the machine is 4 ft by 8 ft; table height is 36 in.; net weight, approximately 4,500 lb.

M-42—Drilling Machine For Steering Gear Parts

For drilling, counterboring and reaming steering gear idlers and third arm brackets, LeMaire Tool & Mfg. Co. of Dearborn, Mich., comes forward with a two-way horizontal six-spindle drilling machine with four-position trunnin.

The machine consists of fabricated steel center base which supports the fixture trunnion and houses the coolant tank, with two cast iron standard end bases, each of which supports a No. 5000 twin ram unit for driving and feeding a three-spindle head mounted on guide bars. The trunnion carries four fixtures and is manually indexed.

In operation, at the first station, load-

ONE OIL DOES WORK OF TWO

Dual-Purpose Sunicut Replaces Two Former Oils; Dilution Ends; Finishes Improve; Tool Life Lengthens

When one oil does work formerly requiring two . . . and with marked superiority . . . it doesn't make good sense to keep on buying two.

That is precisely why a prominent ball bearing manufacturer changed to Sunicut. He had been using one oil for lubricating his automatics, and another for cutting, but without complete satisfaction. The lube oil kept diluting the cutting oil by leaking into it. As a result, he got poor finishes and tool life was short. A Sun representative, called in to study the situation, advised using a dual-purpose grade of Sunicut. Adoption of his recommendation solved the problem.

For three years now, Sunicut has been used by the entire automatic department with complete satisfaction. A year ago a switch was made to the *new* Sunicut with Petrofac, Sun's revolutionary all petroleum additive, and even better performance has resulted.

The new Sunicut grades, transparent and non-emulsifying, have been thoroughly "Job Proved." Excellent results are being obtained on automatics machining all types of steel and brass at all practical feeds and speeds. For further information, call or write your nearest Sun Office.

SUN OIL COMPANY · *Philadelphia 3, Pa.*
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SUN PETROLEUM PRODUCTS
"JOB PROVED" IN EVERY INDUSTRY

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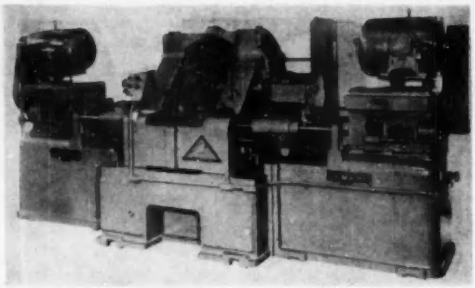

LeMaire drilling, counterboring and reaming machine for steering gear idlers and third arm brackets

ing takes place. At the second station, the part is drilled from both sides. At the third station, counterboring is done from both sides. At the fourth station, reaming is done from both sides.

The indexing mechanism of the trunnion is interlocked with the hydraulic units in such a way that units will not operate if the trunnion is not properly located with the plugging bar in place, or if the trunnion is indexed in the wrong direction, or if more than one station is included. This makes it impossible to run counterbore or reaming tools into parts not previously drilled.

Fixtures are provided with ample chip clearance. Chips drop into a compartment below the trunnion, from where they can be easily removed from the rear of the machine.

Industry's New
"AUDIO NOTEBOOK"
FOR "Sound" RESEARCH
THE HIGH FIDELITY Magnecorder
PROFESSIONAL TAPE RECORDING EQUIPMENT
for NOISE ANALYSIS VIBRATION TESTS SOUND IMPULSES TELEMETERING
Electronic data and test sounds now are recorded for comparison and future reference on low-cost Magnecord tape recordings. Because Magnecordings capture the data as it happens, there's no human error — no lost time. . . . Records faster, cheaper, more accurately!
HIGH FIDELITY — 50 to 15 kc . . . No other recorder offers such wide response at such a low price. Special models for your special needs. Write for specifications.
See How "Sound" Research Can Help Improve Your Product!
Send me further information on Magnecorder tape recordings for industrial uses.
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Mail This Coupon Now!
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M-43—Briquetting Presses For Scrap Processing

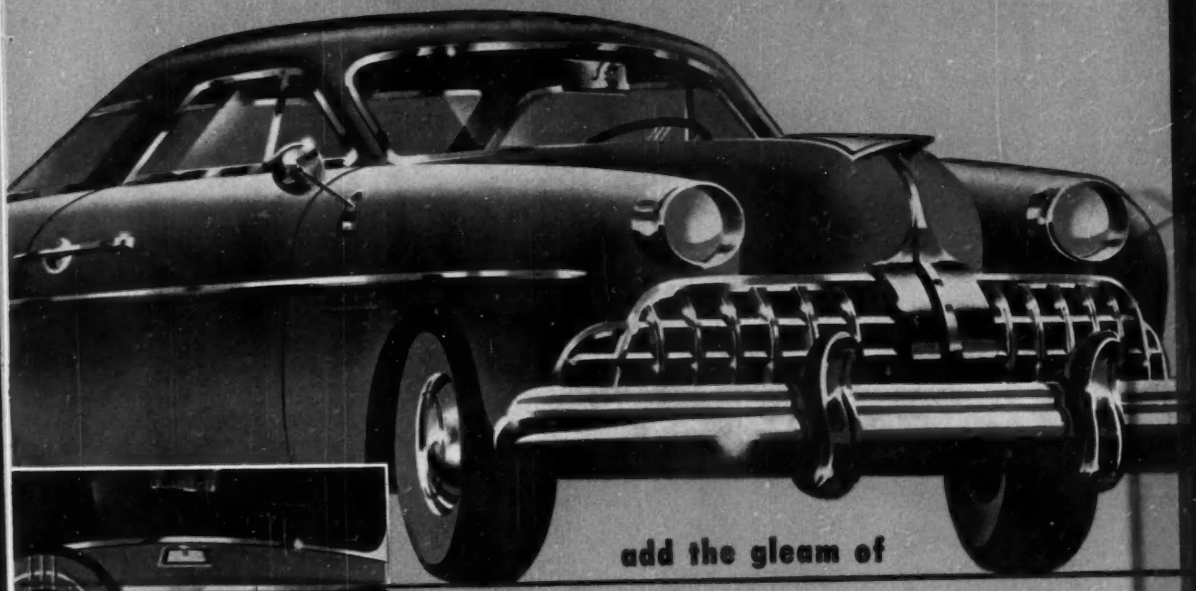
Available from the Milwaukee Foundry Equipment Division of Spo, Inc., Cleveland, Ohio, are Milwaukee briquetting presses in five sizes, for scrap processing needs of metal working plants that produce a large volume of scrap daily from machining operations. The briquetting presses convert low-grade bulk metal turnings, borings, chips and shavings into dense cylindrical metal blocks that are suitable for charging directly into a foundry cupola as high-grade scrap.

Designed to accommodate steel, cast iron, brass, magnesium, bronze and aluminum chips, shavings or turnings, the new presses are automatically controlled, either hydraulically or electrically. A pressurized lubrication system serves all moving parts, and the hydraulic and electric systems are enclosed and protected. Cylinder pressure plates and die holders are cast steel, and piston rods are chrome nickel steel, hardened and ground. Special "chevron" shaped packing rings, which tighten as hydraulic pressures are applied, are utilized. Piston load pressures range from 118 to 350 tons..

In operation, bulk scrap metals are placed in a hopper and then packed by air-powered tampers for subsequent squeeze operation. A hydraulically-actuated ram then converts the scrap chips or turnings into a cylindrical "briquette" which has a density ranging from 70 per cent to 80 per cent. Individual briquettes range in weight from 3 to 11 lb, depending upon size desired and type of scrap being converted. Finished briquettes are said to be clean, free of oil and other cutting lubricants.

for "eye-appeal" beauty

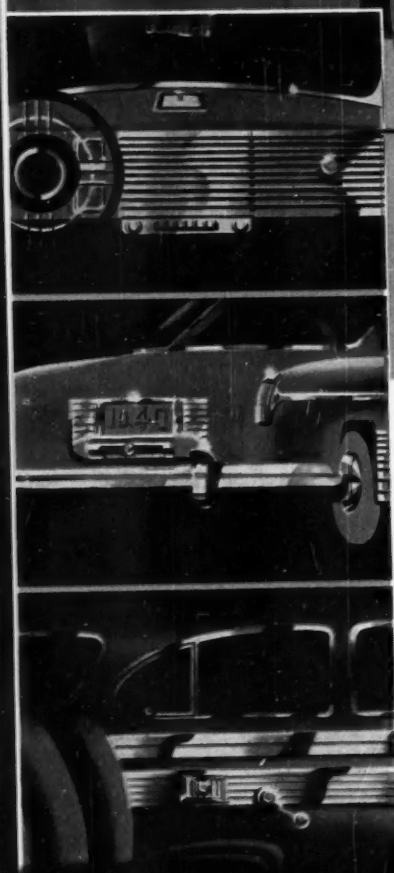
and "buy-appeal" value



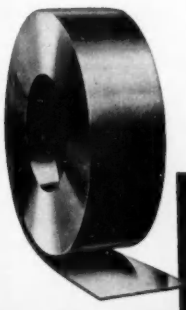
add the gleam of

Superior Stainless

to your pace-setting cars' good looks!



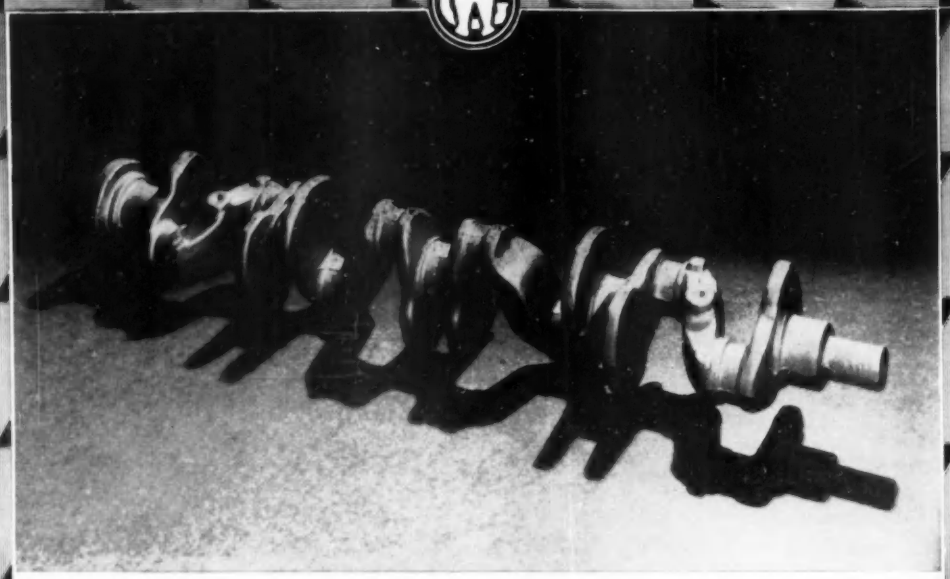
Brightwork of Superior Stainless *stays* bright for the life of the car. Its fine appearance helps sway the initial buying decision—its year-after-year sparkle continues ownership's pride! • And because the fabricator gets the exact widths, thicknesses and tempers he desires in easy handling coils, Superior Stainless speeds volume production at low cost! May we give you the significant facts?



Superior Steel

CORPORATION

CARNEGIE, PENNSYLVANIA



The CRANKSHAFT is probably the most important single part in the modern high-speed, high-compression, internal-combustion engine.

Wyman-Gordon—specialists in the design and forging of crankshafts since the start of the automotive industry—furnished the first heat-treated crankshaft, forged the first six-throw crankshaft, forged the first eight-throw crankshaft, forged the first crankshaft with integral counterweights. In automotive crankshafts and in all types of aircraft forgings, steel and light alloy, there is no substitute for Wyman-Gordon experience.

Standard of the Industry for More Than Sixty Years

WYMAN-GORDON

Forgings of Aluminum, Magnesium, Steel

WORCESTER, MASSACHUSETTS, U. S. A.

HARVEY, ILLINOIS - - - DETROIT, MICHIGAN

NEW PRODUCTS

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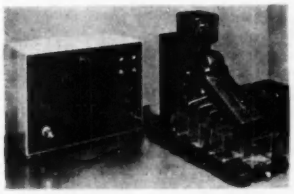
P-64—Automatic Ball Sorter

Model "A" New-Tronic ball sorter placed on the market by Merz Engineering, Inc., Indianapolis, Ind., matches precision steel bearing balls with laboratory precision at production line speed and cost. The balls are automatically sorted into 10 groups, the diameters in each group varying by as little as ten one-millionths in., 5,000 balls per hr makes possible speedy quality control at low cost compared to manual ball sorting.

After the machine is calibrated for size, the operator need only keep the supply hopper filled and empty the containers for the matched balls. One operator can easily attend a number of machines.



Merz Model "A" New-Tronic ball sorter

The Ball Gaging Mechanism has a hopper from which the balls are fed, one at a time, across the anvil under the arm of the gaging head, the impulse from which energizes one of ten solenoids through the electronic system. From the gaging head the ball runs down an inclined track and the energized solenoid diverts it into one of the ten containers for the matched balls. Balls whose diameters are outside the range for which the machine is set are rejected into an eleventh container. The eleven plastic containers are located at the base of the machine and are quickly and easily removed, emptied and replaced. The small synchronous motor, which operates the ball feeding mechanism, and the ten selective relays are mounted on the panel at the rear of the machine.

A gaging anvil having a 150-deg "V" surface is normally used in sorting balls according to diameter. Sphericity may be checked by using a 90-deg "V" anvil and running the balls through the machine more than once; balls that do not "repeat" are non-spherical.

(*Turn to page 68, please*)

Engineered to your production

Schmieg CENTRI-MERGE OVENS

Any Size, Shape, Type
FOR EVERY KIND OF WORK

Whatever your requirements, Schmieg drying and baking ovens are designed and engineered to give you highest efficiency at lowest operating and maintenance cost.

Conveyor or box type, for any installation arrangement, compactly designed to save valuable floor space, engineered to fit smoothly into your production plan, Schmieg ovens *make it easy* for you to turn out the very best paint jobs.

Schmieg ovens give you automatic temperature control, insure against hot spots, are meticulously insulated to prevent heat loss. Every operating essential has been carefully designed and engineered to enable you to safeguard product quality.

So we say—No matter what size, shape or type of oven you may need, for any kind of work, Schmieg ovens give you most for your money.

Consult Schmieg engineers today.

THE *best* AIR PURGE IS CENTRI-MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

210 PIQUETTE AVENUE • DETROIT 2, MICHIGAN

NEW PRODUCTS

(Continued from page 67)

For additional information please use coupon on page 54

P-65—Hose Clamp, Worm Drive Type

Wittek Mfg. Co., Chicago, Ill., makers of "Noc-Out" hose clamps, now offers a new "Sure-Tite" hose clamp of the worm drive type for automotive use.

Available in three sizes (1⅛ in. to 2¾ in. OD) that fit all standard radiator hoses, Sure-Tite hose clamps have a high tensile carbon steel band to withstand high-torque loads, a compact streamlined housing and hardened one-piece screw. The band and housing are spot welded together assuring maximum balanced strength and dependability. All parts are rustproofed by cadmium plating.

Wittek "Sure-Tite" hose clamp

Wittek Sure-Tite hose clamps are packaged in standard cartons of individual sizes, 50 clamps per box, and in a display carton containing 100 clamps made up of the three sizes.

Lamb Electric

special application MOTORS

May Be YOUR Answer to Lower Costs, Better Product Performance

You may find, as have many other designers of motor-driven products, that the use of Lamb Electric Motors will enable you to reduce costs as well as increase product appeal.

Specially engineered for each application, Lamb Electric Motors make available the following six important advantages:

IN THE MOTOR—
1. Reduced costs, weight, space.
2. Exact mechanical and electrical requirements.
3. Thorough dependability.

IN THE PRODUCT—
4. Better performance.
5. Improved eye appeal.
6. Compactness, less weight.

Our engineering department will welcome the opportunity to work with yours —while your product is still in the design stage—to help obtain these results.

THE LAMB ELECTRIC COMPANY
KENT, OHIO

Double shaft extension motor for flap control on small aircraft and other dual uniform control applications.

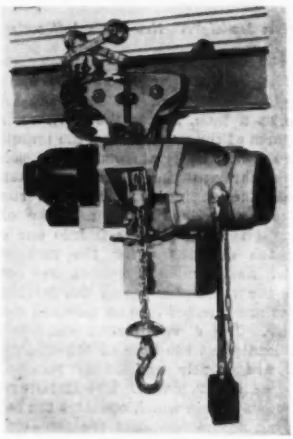
Planetary inbuilt speed reducer permits a straight line drive, symmetrical construction, insures good performance.

THEY'RE POWERING AMERICA'S Finest PRODUCTS

Lamb Electric
SPECIAL APPLICATION FRACTIONAL HORSEPOWER MOTORS

P-66—Chain-Type Electric Hoist

Lifting speeds up to 41 ft per min, a lower as well as an upper limit stop, and a wide "pick-up" angle, are three of the new performance features of the chain-type Load King electric hoist announced by The Yale & Towne Mfg. Co., Philadelphia Division, Phila., Pa. Available in load capacities of 500, 1000 and 1500 lb, standard models lift loads through any height up to 40 ft.

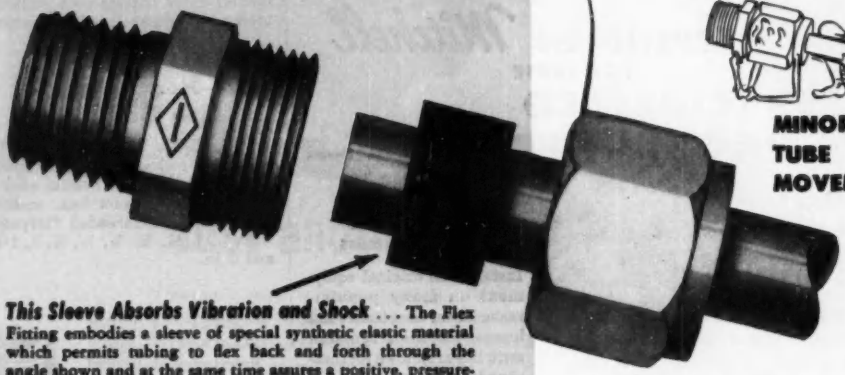


Yale chain-type Load-King electric hoist

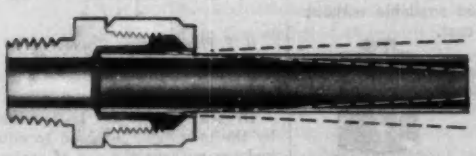
A link chain, over an electrically

IMPERIAL FLEX FITTINGS

for connecting tubing where there is

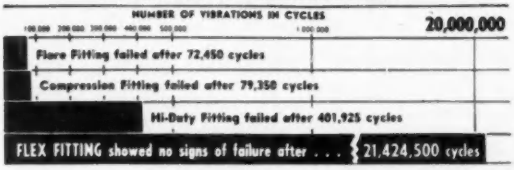


This Sleeve Absorbs Vibration and Shock . . . The Flex Fitting embodies a sleeve of special synthetic elastic material which permits tubing to flex back and forth through the angle shown and at the same time assures a positive, pressure-tight seal.



Flex Fitting Makes Joints Virtually Indestructible by Vibration . . . On tests where ordinary fittings failed after 73,000 cycles of vibration, Imperial Flex Fittings have withstood over 20,000,000 cycles without failure as indicated in the chart below:

COMPARATIVE VIBRATION TEST


NUMBER OF VIBRATIONS IN CYCLES
1,000,000
20,000,000
Flare Fitting failed after 72,450 cycles
Compression Fitting failed after 79,350 cycles
Hi-Duty Fitting failed after 401,925 cycles
FLEX FITTING showed no signs of failure after . . .
21,424,500 cycles

For All Kinds of Tubing . . . Imperial Flex Fittings can be used with all types of seamed and seamless metal tubing, including copper, aluminum, thin-wall steel, monel, stainless steel, etc.

Easy to Install . . . All that is necessary is to slip nut and Flex sleeve over tubing. Then insert tubing into fitting body as far as it will go, and assemble. On sizes larger than ½" O.D. and where higher pressures are involved, end of tubing should be belled slightly.

Proved by Extensive Use in the Field . . . Used as standard equipment on trucks, tractors, diesel engines, oil filter connections, heavy power equipment, machinery, etc.

CATALOG No. 344-C gives complete engineering data on Flex Fittings including types, sizes, dimensions, specifications and applications. *Write for your copy.*

THE IMPERIAL BRASS MFG. CO., 1241 W. Harrison St., **Chicago 7, Ill.**

IMPERIAL

PIONEERS IN TUBE FITTINGS AND TUBE WORKING TOOLS

NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 54

driven sheave, supports the load. This permits extra long lifting lengths since the wound-up chain does not wrap around a drum but collects instead in a metal container as the hook raises. Thus, for high lifts requiring long chains, all that is needed is a larger chain container—not a larger drum or multiple-layer drum windings. The single-strand load chain securely engages six pockets of the sheave to move and hold heavy loads with a minimum of chain friction.

The hoist hook can "reach out" as far as 30 deg from the vertical to pick up loads. The wide pick-up angle and the flexibility of the load chain—free of twists and kinks—enables a reduction of time and power consumed in "inching" the hook up or down for close "spotting."

The limit stops prevent over-travel of the hook when lifting or lowering. They operate when the hook reaches predetermined levels and break the electrical circuit to return the push-button controller from either the "up" or "down" position to "neutral."

The hand controller is suspended by a light-gage chain so that neither electric cable nor electrical connections take the weight of the controller. The control box is situated at a level convenient to the operator and the flexible control cable carries only switch-energizing current, and not load current.

DEPEND ON *Mitchell* FOR THESE SPECIALIZED PRODUCTS

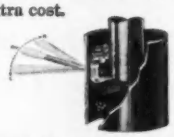
- Ignition switches
- Turn signal switches
- Rolled shapes

AUTOMOTIVE IGNITION SWITCHES

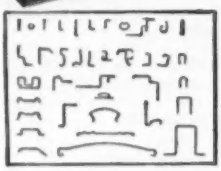
Installed as original equipment on many popular-make motor cars, trucks and buses, Mitchell ignition switches are known for their sturdy construction and extra long life. "Radio" position available without extra cost.

Mitchell ignition switches, turn signal switches and rolled shapes meet the most exacting specifications of the automotive industry for quality and excellence of design. You will find these Mitchell products widely used by leading manufacturers of cars, trucks, buses and tractors.

Mitchell clamp-on and screw type semi-automatic turn signal switch for trucks, cars, buses, tractors.



Mitchell 6-wire concentric type semi-automatic turn signal switch used in passenger cars.



TURN SIGNAL SWITCHES — Mitchell semi-automatic, self-cancelling turn signal switch affords motorists an easy, positive method of indicating right or left turns — gives pedestrians and approaching and following vehicles accurate, fully visible turning information.

ROLLED SHAPES—Mitchell offers a complete range of metals, designs and gauges in stainless steel, aluminum, brass, bronze, copper; cold rolled, drawn and pressed for automobiles, airplanes, architectural requirements, railroad cars, radios, television receivers, all industrial uses.

Our sales engineers work with you in the application of Mitchell products to your specific designs. Call on us at any time.

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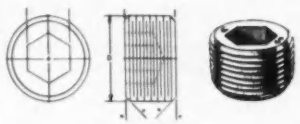
IGNITION AND TURN SIGNAL SWITCHES • ROLLED SHAPES • DOVETAILS
UNITED AIR CLEANER DIVISION • CHICAGO 28
AIR CLEANERS • METAL STAMPINGS

P-67—Hex Socket Pipe Plug

The U. S. Plug & Fitting Co. in Cleveland and Canton, Ohio, announces a new and improved special alloy steel, brass and aluminum hex. socket pipe plug, which is threaded "Dryseal" in sizes 1/16, ⅛, ¼, ⅜, ½, ¾, 1, 1¼, 1½, and 2 in.



U. S. Plug & Fitting Co. hex. socket pipe plug thread "Dryseal"

Dryseal thread has been established by the industries involved to eliminate leakage without the use of sealer compounds or dope of any kind. The seal is accomplished by metal to metal contact which is produced by a truncation of the major diameter (root) of the internal thread and a truncation of the minor diameter (root) of the external thread. Positively leak proof, smooth threads, true roundness, uniform taper and strong, clean sockets, are said to result. Dryseal threads have been adopted as standard on General Motors, Chrysler, Ford, International Harvester and other large manufacturers' products. These Dryseal threaded pipe plugs are entirely interchangeable with the present standard Briggs type pipe thread.

U. S. Plug & Fitting Co. thread all of their pipe plugs from 1/16 in. to 4 in. Dryseal at no extra cost. Manufacturers of pipe plugs threaded Dryseal in cast iron, brass, steel and aluminum. Styles are square head, square head solid. Countersunk sizes, are offered in 1/16 in. 4 in. inclusive.

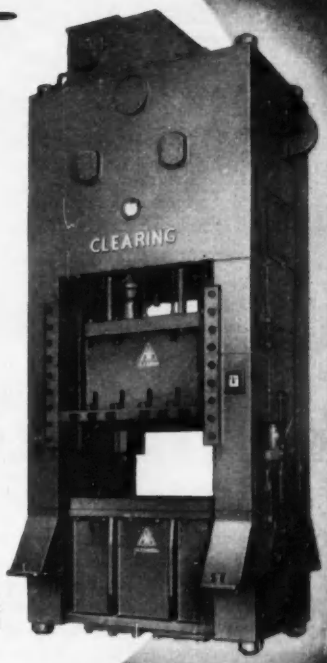
(*Turn to page 72, please*)

Just another sheep?

You don't have to be an expert to tell that this fellow is a top producer of wool because it literally "sticks out all over him." Many generations of breeding toward a specific purpose thus show their effective results.

The production-ability of a Clearing press doesn't show on the surface, but experienced metal-working men know it's there because they've seen Clearings on the job. Painstaking and forward-looking engineering through the years have given Clearing presses the rigidity, the fast action, the precision, the low maintenance demands that add up to lower production costs and greater man-hour output.

When you buy a press, look below the surface. Be sure you get Clearing construction and features that mean top performance and maximum profit in operation.



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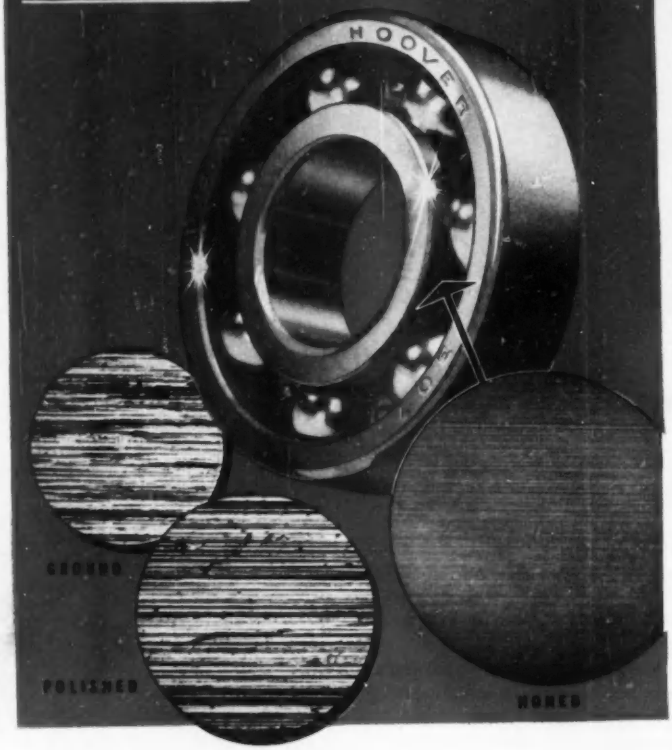
HONED RACEWAYS



exclusive with

HOOVER BALL BEARINGS

The photographs reproduced above are magnified one hundred times so you can see the difference between ground, polished and honed raceways. The process and the special machines for the honing operation are exclusive, patented, Hoover developments. Honing by Hoover goes far beyond grinding and polishing to achieve a surface that assures amazing quietness plus *90 per cent longer bearing life . . . 30 per cent greater load capacity.* That's why Hoover Ball Bearings are the choice of distinguished American manufacturers of fine machines and equipment.

The Hoover Engineering Manual will be mailed free to engineering and purchasing executives requesting a copy on their business letterhead.

THE ARISTOCRAT OF BEARINGS

HOOVER BALL and BEARING CO.
Ann Arbor, Michigan

NEW PRODUCTS

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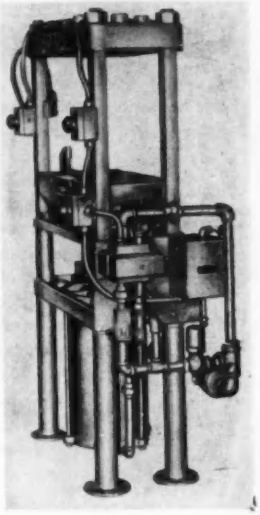
(*Continued from page 70*)

P-68—High Speed Molding Press

A high speed, semi-automatic, air operated, platen type press for molders of Plaskon alkyd resins is announced by Hannifin Corp., Chicago, Ill. Designed to close fast, but gently, it is compact and self-contained, and adjustable to 2 second speed, if required, with special controlled slowing down of



Hannifin 15 ton high speed air operated press, for molding alkyd resins

the platen at the instant of closing to permit accurate molding of delicate parts. This closing action is made possible by a system of valving in combination with a leverage arrangement which enables the press to develop 15 tons output force with 80 psi air supply.

Control is by dual push buttons connected to a ¾ in. Hannifin Model NE electric valve. An instant reversing button is provided in the circuit. Auxiliary equipment includes automatic timer, and the press is completely adjustable for speed, cycle, and timing desired.

The press is of the four column type with cylinder located below the platen. It measures 14 in. by 21¾ in. between columns with 7 in. maximum stroke. Daylight, platen down 17½ in.; platen up, 10½ in.

(*Turn to page 74, please*)

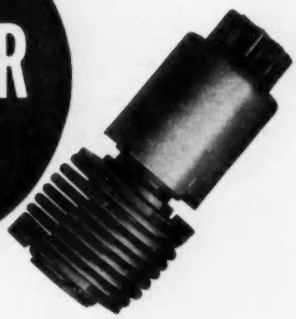
NO MATTER WHAT THE TYPE OF STARTING . . .

you can do it

BETTER–
MORE ECONOMICALLY

with the

Bendix STARTER Drive



There isn't a better proven, more simply designed, or more easily mounted starter drive than the Bendix* Drive. Over 79,000,000 have been installed. It has fewer parts than any other starter drive system. Its compactness lets you mount starting motors almost anywhere. These are the basic reasons why Bendix Starter Drives are preferred by most manufacturers. Cost-wise and performance-wise—from installation to service—it's the most economical starter drive you can buy! Look into Bendix Starter Drive cost savings. Your inquiries will receive immediate attention.

*REG. U. S. PAT. OFF.

ECLIPSE MACHINE DIVISION of Bendix AVIATION CORPORATION
ELMIRA, NEW YORK
Detroit Office: 8-212 General Motors Bldg.
Export Sales: Bendix International Division, 72 Fifth Avenue, N. Y. 11, N.

NEW PRODUCTS

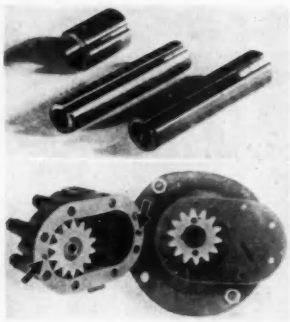
(Continued from page 72)

For additional information please use coupon on page 54

P-69—Multi-Purpose Pressed-Fit Fastener

For multifarious metal-fastening applications, the Rollpin, a new product of the Elastic Stop Nut Corp. of America, Union, N. J., is an all-purpose, pressed-fit, self-locking pin with chamfered ends, engineered to replace dowel, pivot, tapered and grooved pins, which ordinarily require a key or some supplementary method to hold them in place. A low cost, multi-purpose fastener, it is already in automotive use as a spring retainer in a transmission shift assembly; as an attachment of the transmission shift lever to the column shaft; as a servo actuating lever bearing roller; and as a hinge pin in the lowering mechanism on a convertible. It is also in use as a gear shift lever fulcrum pin; as a fastener of gears to a shaft on an over and underdrive unit; and as a lock pin in an automatic transmission. Other specific automotive uses are on test—such as those for a king pin locking pin, wind wing handle locking pin, door hinge and latch pins, etc.

The Rollpin itself, is a piece of metal rolled into the shape of a cylinder with a gap or slot which parallels the long axis of the hollow cylinder. Both ends of the cylinder are chamfered, or beveled, so the pin can be driven and compressed into a hole that is, by design, smaller than the diameter of the pin. The slot permits compression of the cylinder as the pin is driven in, and the resulting tension, caused by the constant pressure exerted by the Rollpin against the walls of the hole, secures it in position even against extreme vibration and shock.



Top—Close-up of ESNA Rollpins. Upper pin is ¾ in. long fitting hole diameter of 0.500 in. Lower pin is 2 in. long. Bottom—Arrows show two ESNA Rollpins employed as positioning dowels in lubrication pump assembly of the Cummins H-600 Diesel engine.

ESNA reports that because the Rollpin is not a headed type of fastener and does not have to be held in position by a nut or other types of fastening devices such as a key, production economies are obtained. The slotted cylindrical design affords a high pressure, shake-proof grip in holes drilled to normal production tolerances. As a result, expensive hole reaming operations are avoided. The Rollpin is simply and rapidly inserted with hand tools or automatic jib assemblies. It can be simply removed by driving it out with a drift pin or pin punch. The pin is

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assure top grade quality and dependability in your engines. All the plus values of skilled craftsmanship, expert "know-how" and finest materials are automatically yours when you select Johnson Tappets.
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The Johnson Self Locking Tappet Screw has proven most satisfactory in cast iron and steel tappets.
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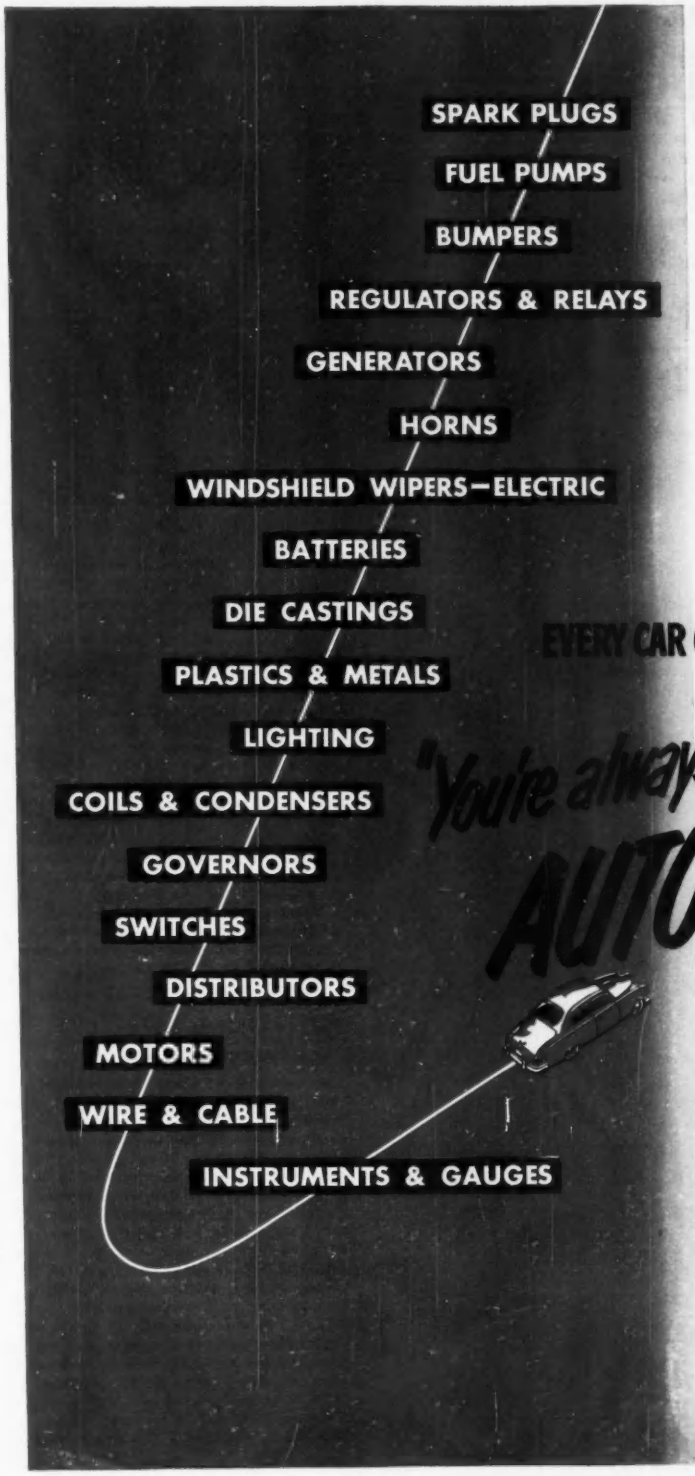

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"You're always right with AUTO-LITE"

TODAY more than 400 Auto-Lite products are standard equipment on many of America's finest cars, trucks and tractors . . . convincing proof of unfailing dependability. That quality is reflected in the public acceptance of the name Auto-Lite—the best advertised name in the automotive after-market. It is reflected, too, in the establishment of Auto-Lite service facilities throughout the world. Today's buyers of cars, trucks and tractors know "You're Always Right...With Auto-Lite."

THE ELECTRIC AUTO-LITE COMPANY
Toledo 1 Ohio

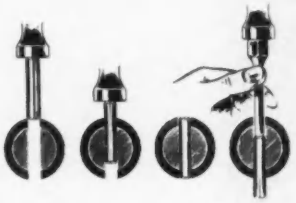
NEW PRODUCTS

For additional information regarding any of these items, please use coupon on page 54

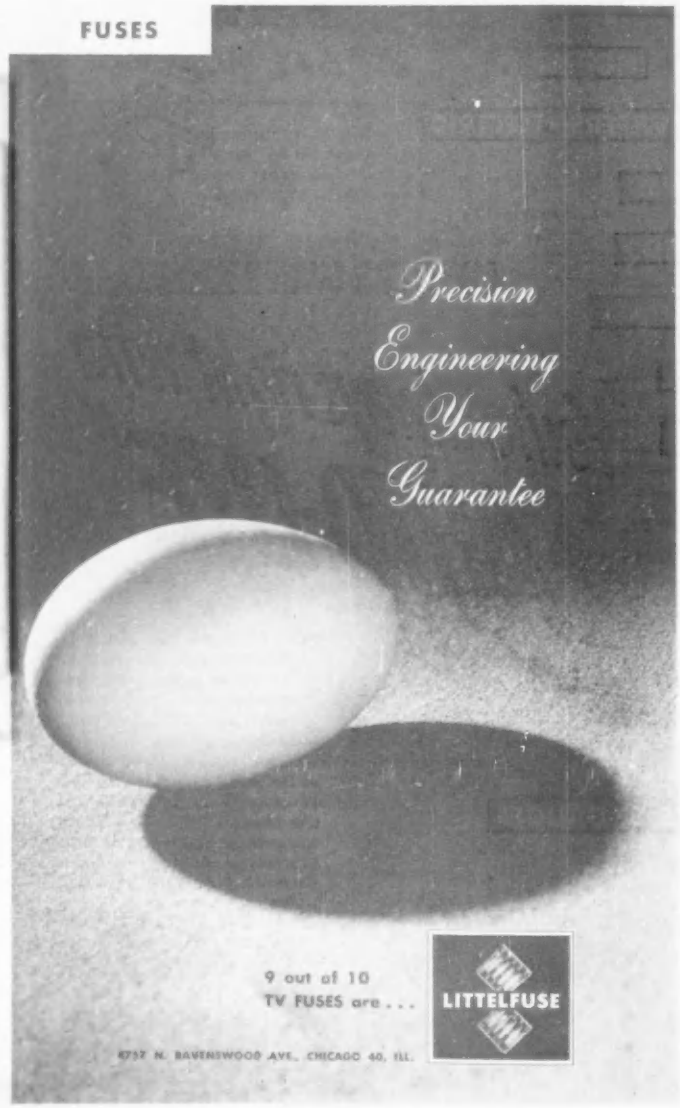
said to retain its locking characteristics through repeated insertions; its shear strength exceeding that of a cold rolled pin of equal diameter.

Applications of the Rollpin fall into the following five general groups: as fastening pins, pivot or hinge pins, cotter keys, shafts, and dowels.

At present Rollpins are made in thirteen sizes to fit hole diameters ranging from 0.078 (5/64-in.) up to 0.500 (½-in.), in stock lengths, beginning with 3/16-in. in smaller diameter pins, and made from SAE 1095 steel and Type 420 stainless steel. Zinc or cadmium plated finishes may be specified. Pins are also made from beryllium copper.



Steps in inserting ESNA Rollpin in predrilled hole, and driving it out with drift pin or punch.



P-70—Stacking and Nesting Tote Box

Announced by the United States Rubber Co., New York, N. Y., is a new type stacking and nesting tote box formed in one seamless piece from the company's Royalite thermoplastic material. Handles are formed into the roll of the upper lip so that the tote box can be picked up from any side. All corners are rounded.

The Royalite tote box is designed for criss-cross stacking, with adequate locking when boxes are stacked. Contents of each can be easily seen when stacked.

The boxes take up little space, are very light weight, easy to handle and easy to clean. They are extremely tough, with high resistance to impact. They are also acid-resistant, non-toxic and have a low water absorption, less than one-half of one per cent.

These stacking and nesting boxes in a range of widths and depth are available in four colors so that contents can be identified from a distance.

P-71—Molten Metal Thermocouple

A molten metal thermocouple for ferrous metals has been developed by Wheelco Instruments Co., Chicago, Ill., designed to withstand melting temperatures up to 3200 F and all casting temperatures normally encountered in the production of precision steel castings in the foundry. Temperature readings can be made in less than 30 seconds with extreme accuracy. Use of the Wheelco molten metal thermocouple, it is pointed out, assures proper pouring temperature and prevents costly fuel loss due to overheating.

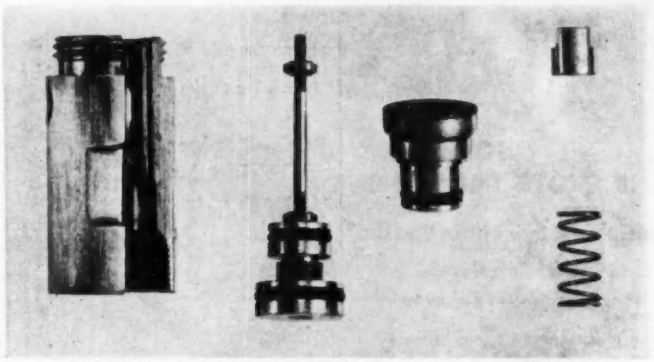
The new thermocouple is a well balanced immersion type sensing unit for use with any pyrometer. It has an adjustable extension and uses a 27 gauge platinum-platinum 10 per cent rhodium elecent. A telescoping feature permits feeding the platinum element to the

(Advertisement)

COPPER ALLOY BULLETIN

REPORTING NEWS AND TECHNICAL DEVELOPMENTS OF COPPER AND COPPER-BASE ALLOYS

Prepared Each Month by BRIDGEPORT BRASS COMPANY "Bridgeport" Headquarters for BRASS, BRONZE and COPPER



Cut-away body, piston and stem assembly, floating valve, tanged nut and spring for relay emergency valve for compressed air braking system. Brass is used for all parts with exception of spring and stem—Courtesy Homer T. Seale, Inc., Los Angeles, Calif.

Compressed Air Valve Designed for Screw Machine Production

Valve bodies involving deep drilling, smooth bores, accurate threads, milling and no leakage from air or liquids under pressure can be produced economically in screw machines from bar stock. This is especially true where the exterior is of cylindrical design.

Free machining brass rod was used in the illustrated cut-away relay emergency valve for the compressed air braking system for tractors and trailers. The 3.4% lead and correct temper imparts the highest machinability of any copper-base alloy. Twenty to 40% increase in machining speeds can be obtained over cast metals.

Concentricity Important

Three concentric diameters are drilled and bored in the body. Concentricity and smoothness are especially necessary on the two smaller diameters because of the step plunger which slides in them.

On finishing of bores of this type there is a tendency to leave too little stock for the boring tool or reamer. Burnishing then takes place giving a smooth looking but wavy surface. At the same time tool wear is increased due to greater heat generated by the rubbing action. The ¾ in. pipe thread is also tapped on the screw machine. Smooth finish on the drawn bar stock eliminates the necessity for turning.

Deep Hole Accurately Drilled

As secondary operations, a ⅜ dia. hole is drilled, flats milled and a bleeder hole 3/32 in dia. and 1⅜ long is drilled. Although position of this latter hole is not too critical from an operational standpoint, it is so close to the surface of one bore that it must be drilled without "walking". Here again bar stock simplifies this operation. In castings, porosity and hard spots often cause the drill to "walk". Porosity also would be a danger from the standpoint of leaking.

The step plunger is turned and drilled part way through and then a connecting hole is cross-drilled from one side of the center diameter. Grooves are also cut to take the composition seals. Size and position is maintained through step forming tools. The same procedure is used for producing the four-step top piston.

For the tanged top nut, the milling is secondary after the part has been turned, drilled and tapped.

High Corrosion Resistance

The use of free machining brass rod for these four parts and stainless steel for the rod spring and two nuts impart a high degree of corrosion resistance.

Moisture, dust and other foreign materials are common in compressed air systems and would cause jamming or leaking through corrosion of ferrous metals.

Likewise, the exterior of the valve is exposed to both atmospheric conditions, mud and water. The brass withstands attack from these.

Machining Articles Available

We will be glad to send you reprints of the articles "Correct Machining of Copper-Base Alloys", also "Machining Silicon Aluminum Bronze". These include information on tool angles, coolants, speeds, feeds and characteristics of the various alloys.

Cut-away relay emergency valve for tractor and trailer compressed air braking systems—Courtesy Homer T. Seale, Inc., Los Angeles, Calif.

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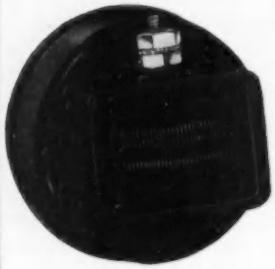
SISSON Electrimatic CHOKE

SOLVES ALL ENGINE CHOKE PROBLEMS!

Does What No Other Choke Can Do!

Only 'Electrimatic' Can Give:

- **Easier starting** . . . in any weather . . . the instant the starter is pressed
- **Controlled Choking at All Engine Temperatures** assures smooth engine performance during critical warm-up period
- **Exclusive Automatic Climate Control** assures perfect choking in any climate . . . requires no manual adjustment
- **Better Gasoline Mileage.** No over-choking, no flooding . . . stops gasoline waste
- **Trouble-free Operation.** Nothing to get out of order . . . lasts the life of the car



Exclusive 'Electrimatic' Features Assure Correct Choking at All Temperatures

Exclusive Sisson ELECTRO MAGNET goes into action when you step on the starter. Closes choke valve to proper position required by engine temperature. Assures correct choke for fast starting at any temperature without flooding

Controlled thermostat action (exclusive with Sisson) flattens the choking curve during critical warm-up period. Finest quality thermostat metal in extra strong spring assures more accurate and more positive control of choke valve.

EASY TO INSTALL . . . Fits most carburetors designed for automatic choking . . . is readily installed as original equipment. For performance curves, specifications and installation details, write or call:

SISSON CHOKE DIVISION

THE PIERCE GOVERNOR CO., INC.

1615 OHIO AVENUE • BOX 1000 • ANDERSON, INDIANA

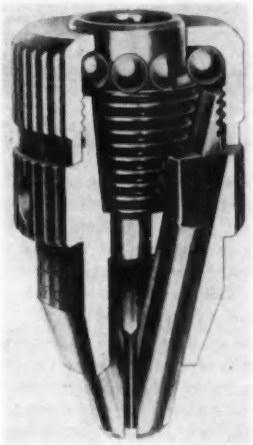
NEW PRODUCTS

For additional information please use coupon on page 54

proper length within the protecting tube, wihout need for cumbersome reassembling of the unit.

P-72—Keyless Drill Chucks

Self-tightening and self-centering features with a high degree of accuracy and rigidity are now made possible with the new hand operated Ettco-Emrick keyless ball bearing drill chucks put out by the Ettco Tool Co., Inc., Brooklyn, N. Y. Drills, reamers, counterbores, end mills or any type shank



Ettco-Emrick keyless ball bearing drill chuck

tool, etc., when inserted and hand tightened, are centered and tightened against slippage by the machining action of any type drill press, electric drill, lathe, milling machine, etc.

Cone shaped screw of the chuck directly actuates three gripping jaws. Jaws are keyed in the body—the screw does not take the jaw torsional strain. The large ball bearing thrust with self-centering construction is said to afford accuracy and gripping power under heavy loads, plus ease in releasing the grip.

These keyless ball bearing drill chucks are available in four sizes with chuck capacity ranging from 0 to ⅝ in. in all types to fit any tapered or threaded spindle.

$3.50 A MONTH*

... AVERAGE MAINTENANCE COST ON

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in HOTPOINT'S plant 5 at Milwaukee!

Here is proof of efficient maintenance procedure *and* outstanding press performance . . . on a high speed production line where press operating expense is a vital cost factor. In more than two years of operation, these Danlys have required no major overhaul or repair—no clutch relining and only one take-up! Highly effective routine maintenance with emphasis on such things as regular lubrications helps, keep small adjustments from becoming costly jobs.

Records like this in nearly every installation are proving Danly leadership in press design and construction. Check the advantages that Danly Presses offer you . . . Danly field engineers are at your service.

Write today for your copy of the new Danly Straight Side Press Catalog.

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IN REPLY PLEASE REFER TO

Sept. 23rd, 1949. Carl Pfeifer

Niagara Machine & Tool Works
637-697 Northland Avenue
Buffalo 11, N. Y.

Attn: Mr. H. D. Rosenkrans

Gentlemen:

We are sending under separate cover a picture of our new Niagara Shearing Machine.

May we add, at this time, that we have been using your machines for over 60 years and still find that they are the best from our standpoint of view and experience. We have had several opportunities to change over but always come back to Niagara.

If you care to use our statement along with the photograph, please be free to do so.

Good wishes for continued success of your product.

Very truly yours,

T. E. CONKLIN BRASS & COPPER CO. Inc.

C. Pfeifer

Carl Pfeifer

NIAGARA MACHINE & TOOL WORKS • BUFFALO 11, NEW YORK

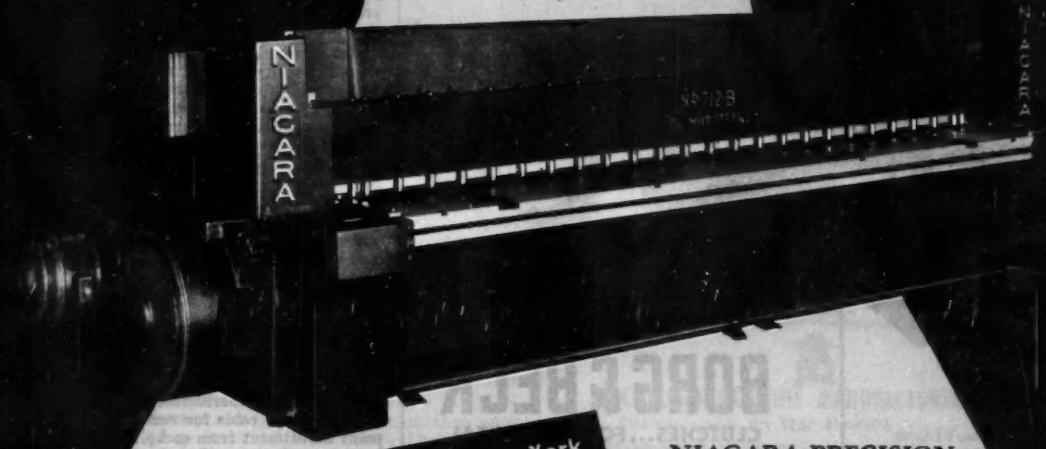
reports 60 YEARS of satisfactory service

Such outstanding service is no accident. It follows naturally from the accuracy, convenience and stamina built into every Niagara Shear.

These qualities result from:

- Niagara's years of experience in building shears.
- Designs incorporating time tested, basic engineering principles.
- Use of construction materials, best suited for the particular function of each individual part.
- Unsurpassed workmanship.

For further details about Niagara Shears, write for Bulletins.



District Offices: Detroit, Cleveland, New York

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NIAGARA PRECISION UNDERDRIVE SQUARING SHEARS will operate continuously at capacity producing clean and accurate cuts.

Manufacturers of America's Most Complete Line of Presses, Shears, Machines and Tools for Plate and Sheet Metal Work

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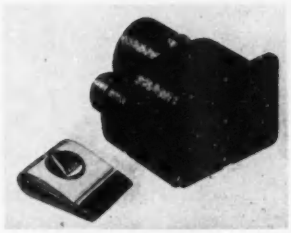
U-13—Light-Weight Rotary Actuator

Weighing less than one lb, a small, light-weight rotary actuator introduced by Lear, Inc., Grand Rapids, Mich., develops a maximum peak output of 110 in.-lbs with a normal rated peak load of 60 in.-lbs. This new low-cost actuator produces an non-linear torque output which approximates typical aircraft duct damper and fuel valve load curves, resulting in high "breakaway" and "tight-closing" torques required for valve operation plus high efficiency over its entire cycle. Designated as the model 167A, this newest addition to the complete line of Lear



Lear light-weight rotary actuator, Model 167A

Electro-mechanical actuators, automatic pilots, gyros, pumps, and valves requires less than one second for its full 90-deg shaft rotation under the normal rated peak load condition of 60 in.-lbs.

Actuator shaft speed varies over the operation cycle such that valve closing begins at high speed but actual shutoff takes place at slow speed, thus eliminating ram effects in the hydraulic system. Incorporated is an adjustable slip clutch which also compensates for possible hydraulic surge loads. Positive mechanical stops are used, and provision may be made for manual operation of the unit in the event of power failure.

The integral 26-volt DC split-series wound motor is rated for an intermittent duty cycle of one second on, five seconds off; the entire unit designed to latest government specs. Beside applications for fuel, oil and pneumatic valves, it is applicable to heat control, and hydraulic valves, locking controls, dampers and replacement of mechanical and solenoid-operated devices, especially where the load varies with the stroke.

U-14—Aircraft Heater Control

Designed by Barber - Colman Co., Rockford, Ill., for aircraft heater control, a new duct thermostat is equipped with a flexible cable for remote control point adjustment from cockpit or flight attendant station. The thermal sensing element maintains a constant control point with variations in duct air velocity. Standoff flange mounting eliminates variations in calibration with changes in ambient air temperature. Maximum thermostat operating temperature is 450 F; maximum range is 200 F. Standard control cable lengths are 4 ft and 8 ft. Electrical components are explosion proof.

(*Turn to page 85, please*)

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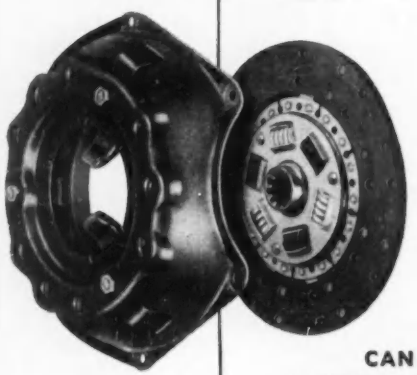
BORG & BECK®

means . . . CLUTCHES built to the exacting standards which have made the name BORG & BECK famous for 36 years!



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CLUTCHES . . . FOR THAT VITAL SPOT WHERE POWER TAKES HOLD OF THE LOAD

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BORG & BECK DIVISION

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Only C/R *gives you*
3-WAY DEPENDABILITY

Regardless of its design or material used in its sealing elements, what *you* want in an oil seal is complete dependability. Under all circumstances, it must retain lubricants within the mechanism, effectively exclude moisture and foreign matter and give long, trouble-free service. That's dependability . . . and that's what helps sell *your* product.

That is why Chicago Rawhide is so important to you. When you choose Chicago Rawhide oil seals you get unmatched research and manufacturing experience in these three specialized fields:

OIL SEAL DESIGN—Since the days when Chicago Rawhide made early automotive oil seals, more motor vehicles, farm implements and industrial machines have been equipped with Chicago Rawhide seals than with any other shaft-type sealing devices.

LEATHER PACKING ELEMENTS—For more than seventy years Chicago Rawhide's *Sirvis* Leather Division has specialized in the development and manufacture of leathers for fluid retention and other mechanical applications.

SYNTHETIC RUBBER ELEMENTS—Chicago Rawhide were pioneers in the development of oil-resistant synthetic rubber for sealing purposes. Today Chicago Rawhide *Sirvene* synthetic rubber products are in use all over the world under the most difficult operating conditions.

Only Chicago Rawhide oil seals give you this three-way assurance of dependability. You can always be sure that Chicago Rawhide "Perfect" Oil Seals will be right for *your* job.

Chicago Rawhide engineering service is always available for the solution of your particular sealing problems.

CHICAGO RAWHIDE MANUFACTURING CO.

1310 Elston Avenue **OIL SEAL DIVISION** Chicago 22, Illinois

Chicago Rawhide Manufacturing Company specializes in mechanical sealing and protective products: oil seals and special diaphragms, boots, gaskets, washers and packings of *Sirvene* synthetic rubber and *Sirvis* mechanical leather.

ENGINEERS: We will be pleased to send you engineering data on "Perfect" Oil Seals on receipt of your written request.

PERFECT
Oil Seals

A SIRVENE ? No One Knows

It is the *next* Sirvene product. Yours, perhaps. Today it is the envisioned need for a critical pliable part, unusual in design characteristics and physical properties. Tomorrow (figuratively) it is an actuality—specially designed, compounded and developed to meet that need correctly and dependably.

Sirvene products always remain "unknown" until developed to meet the needs of a design engineer. Each Sirvene part is custom-built for a particular application where conditions are unusually difficult. Designed, developed and manufactured under strict laboratory control, Sirvene parts operate in extremes of heat and cold, in the presence of air, oil, water and other solvents and stand up under high pressures, wear and abrasion.

Sirvene can be compounded from oil-resistant elastomers to possess any combination of physical properties and characteristics you require. Whether it is destined for an intricately designed boot or diaphragm or for a simple gasket, it will function dependably at a critical point in your mechanism.

When you have a pliable parts problem that's tough to lick . . . consult Chicago Rawhide engineers. They'll create an "unknown" Sirvene to provide the right answer.

ENGINEERS: For basic information, write for your copy of "Engineering with Sirvene". There is no charge.

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New *AIRCRAFT* PRODUCTS

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(*Continued from page* 82)

U-15—Low Tension Cable

A new aircraft power and lighting low tension cable, a product of Packard Electric Division of General Motors Corp., Warren, Ohio, conforms to Bureau of Aeronautics Specification XEL-38 which calls for a 400 F high heat resistance cable. Approved by the Bureau as Packard Type PE-400, The cable is insulated, single conductor, 1000 volt type. The conductor is silver plated stranded copper and the insulation consists of glass reinforced Teflon laminated tapes with a special enamel finish, all of which is fused together into a solid wall of insulation which strips easily from the conductor for making connections.

The insulation not only withstands extremely high heat but is declared inert to all known solvents. It is also fungi-resisting and withstands abrasion to a far greater extent than the usual cotton braided cable. It is supplied in gauge sizes from No. 20 to No. 8.

U-16—Runway Surfacing Material

A new surfacing material called Aero-Sealz that promises to protect airfield runways from the damaging effects of fuel spilled by jet planes, is revealed by United States Rubber Co., New York, N. Y. It is a solvent resistant rubber compound, which when mixed with tar produces a tough, durable surface that resists the dissolving effects of kerosene type fuel used by jet planes.

Damage caused by this fuel is a major problem in modern airport construction and maintenance, due to its lower rate of evaporation compared with high o-tane gas used by regular planes. During normal operations, spillage from one jet plane may amount to five gallons from warm-up until take-off at the end of the runway.

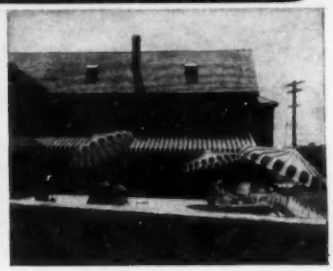
Due to the dissolving effect of the fuel the bituminous pavement is eventually stripped from the upper layer leaving loose or free aggregates. Repeated spillage acts on progressively lower layers with further disintegration taking place from weather, traffic and vibration.

An additional hazard is the loose aggregates which are exposed to the terrific rear-end blasts of jet planes. These hard fragments may be blown in

KOOLVENT VENTILATED ALUMINUM AWNINGS ARE *Alodized*®

FOR EXTRA DURABILITY!

EXTRA PAINT PERMANENCE!



Modern, colorful KoolVent Awnings are designed for all-weather service in all seasons. That means these permanent, ventilated aluminum awnings must withstand the ravages of all elements and all foreign substances — sun, rain, snow, sleet, smoke, industrial fumes, dust, dirt, salt air, soapy water — so destructive to paint life.

To provide the necessary paint-bonding and protective coating that meets the rigid service requirements of KoolVent Awnings, the manufacturers† of KoolVents use "Alodine" to anchor the paint finish and preserve its lustrous beauty.

*"Alodine"®

ALODIZED ALUMINUM provides enduring finish beauty and metal preservation. This fact, called to the attention of your customers by the attractive ALODINE seal, will give your products an extra selling point. The ALODINE seal is available to all qualified users of ALODINE. Details on request.

†KoolVent licensees using "Alodine" and/or Alodized aluminum include:

KoolVent Metal Awning Co. of Cleveland, Cleveland 15, Ohio
KoolVent Metal Awning Corp. of America, Texas Division, Dallas, Texas
KoolVent Metal Awning Co. of Pittsburgh, Glenshaw, Penna.
KoolVent Metal Awning Corp. of Michigan, Detroit 4, Michigan
Aluminum Awning Co. of Arizona, Phoenix, Arizona
KoolVent Aluminum Awning Co., Mercerville, New Jersey
KoolVent Metal Awning Corp. of Indiana, Pendleton, Indiana
KoolVent Metal Awning Corp. of Chicago, Elmwood Park 35, Illinois
KoolVent Aluminum Awning, Div. of Duralco Mfg. Co., Inc., Wheeling, West Virginia
KoolVent Awnings Limited, Oshawa, Ontario
Eastern KoolVent Aluminum Awning Inc., Mineola, Long Island, N. Y.
KoolVent Aluminum Awning Co. of Arkansas, Inc., Little Rock, Arkansas
KoolVent Awnings Limited, Montreal, Quebec
KoolVent Metal Awning Corp. of N. E., Waltham 54, Mass.
KoolVent Metal Awning Co. of P.R., Inc., MacMurray & Co., Inc., Hato Rey, Puerto Rico
KoolVent of California, Inc., Los Angeles, California
Penn-Ohio KoolVent Metal Awning Corp., Girard, Ohio
Buffalo KoolVent Metal Awning Co., Inc., Buffalo 1, New York

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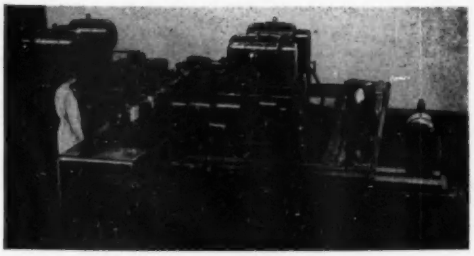


Cross machine for drilling and boring aircraft cylinder heads

the direction of the air intake in front of another jet plane or toward the revolving propellers of another plane moving or parked nearby.

Besides protecting pavement surfaces, Aero-Sealz is claimed to show promise used as a filler to seal joints between concrete slabs in highways and runways.

U-17—Cylinder Head Drilling Machine

To meet demands of the nation's defense program, the Cross Co., Detroit, Mich., has designed and built a new special machine to drill and bore aircraft cylinder heads. A Transfer-matic —Cross' name for its machine tools equipped with automatic transfer mechanisms—it completes the work at four cutting stations, and an additional station is provided for loading.

The machine drills the valve guide holes and rough forms valve pockets and spring compartments. In a second operation, it finish bores the valve guide holes, insert seats and spring seats.

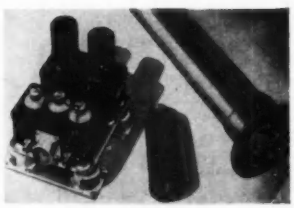
Palletized work holding fixtures are provided with interchangeable adaptors for holding four different parts. Stub tools are used for drilling and forming, eliminating the necessity for tool guide bushings. Coolant is directed through the spindles and tools to the cutting points.

Because of automatic work handling, and other features, one operator completes 80 pieces per hr at 100 per cent efficiency.

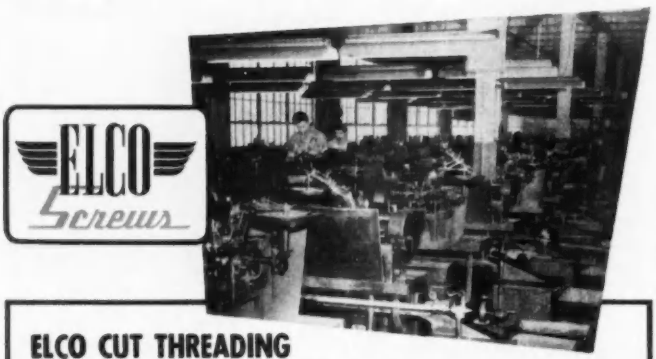
Features include hydraulic feed, rapid traverse, and the use of standard Cross sub-assemblies to facilitate maintenance, reduce down time, and provide some flexibility for part design changes.

U-18—Electronic Fuel Contents Gage

Simmonds Aerocessories Inc., Tarrytown, N. Y., has introduced a compact Pacitron electronic fuel contents gage which will operate high and low level warning lights, fuel transfer pumps,

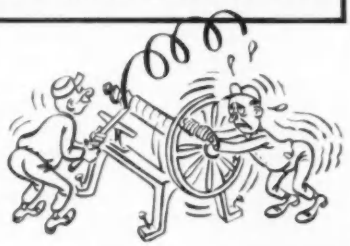


Simmonds Pacitron electronic fuel contents gage



ELCO CUT THREADING PUTS QUALITY IN "THE SCREWS YOU LIKE TO USE"

Cut threading is the oldest—and, for certain purposes, still the best way to make screws. At ELCO, hundreds of cut threaders...each a small, specially-tooled automatic lathe . . . work through the day and much of the night. Each screw blank is threaded by a series of successively deeper cuts. Results — sharp and uniform points, smooth thread surfaces, sharp edges that cut cleanly for easier driving, easy set-up for special forms, and accurate control of significant dimensions. Our extra attention to quality assures you of receiving good screws — ELCO Screws.



CLOSE-UP TO THE POINT

Carving out a 2¼–14 wood screw on an ELCO cut threader. This shows the fifth of seven cuts. Note the *smooth* thread, *clean* edge, and *sharp* point.

ELCO TOOL & SCREW CORP., 1914 Broadway, Rockford, Ill.

Follow the lead of these manufacturers who

Specify FRAM*

*Allis-Chalmers Mfg. Co.
*American LaFrance Foamite Corp.
*B. F. Avery & Sons Company
*Brockway Motor Company
*Buda Company
*Chicago Pneumatic Co.
*Clark Equipment Company
*Continental Motors Corp.
*Cooper-Bessemer Co.
*Crosley Motors, Inc.
*DeLaval Separator Co.
*Detroit Tractor Co.
*Diamond T Motor Car Co.
*Divco Corp.
*Euclid Road Machinery Co.
*Fate-Root-Heath Co.
*Harry Ferguson, Inc.
*Ford Motor Co.
*Ford Tractor Division
*Four Wheel Drive Co.
*Hercules Motors Corp.
*Hill Diesel Engine Co.
*Hobart Bros. Co.
*Frank G. Hough Co.
*Hudson Motor Car Co.
*Hyster Company
*International Diesel Electric Co.
*Insley Mfg. Co.
*Kermath Mfg. Co.
*Landis Tool Co.
*Lathrop Engine Works
*Leader Tractor Co.
*Lincoln Electric Co.
*Lincoln-Mercury Div. of Ford
*Mack Mfg. Co.
*McKay Machine Co.
*Meriam Instrument Co.
*National Supply Co.
*Nordberg Mfg. Co.
*Oliver Corp.
*D. W. Onan & Sons
*Owens Yacht Co.
*Reo Motors
*Schramm, Inc.
*Scripps Motors, Inc.
*Seagrave Corp.
*R. H. Sheppard Co., Inc.
*Star Marine Engine Works
*Studebaker Corp.
*Tropic-Aire, Inc.
*Universal Motors Corp.
*U. S. Thermo Control Co.
*Waukesha Motor Co.
*Willys-Overland Motors
*Witte Engine Works

Prominent manufacturers listed at left equip some or all of their vehicles with filters embodying the Fram Principle of Oil Filtration.

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Protect your engines with this same proven method . . . Fram Oil Filtration. Let us show you how Fram Oil Filters, engineered for your specific problems, can add life and cut maintenance on the engines you manufacture. Write for complete details and technical data. FRAM CORPORATION, Providence 16, R. I. *In Canada:* J. C. Adams Co., Ltd., Toronto, Ontario.

NEW PRODUCTS for AIRCRAFT

For additional information regarding any of these items, please use coupon on page 54

tandem indicators, counter-type indicators and a Simmonds totalizer unit capable of summarizing the contents of as many as six fuel channels.

Means have also been provided in the Pacitron circuit to accommodate the Simmonds fuel compensator, a unit capable of correcting fuel characteristics over the complete range of aircraft fuels, including jet fuels. The Pacitron gage system proper comprises a tank unit of variable capacitance, a 2-tube amplifier, a bridge calibrator and a motor -driven indicator of high output torque. Measurement of fuel quantity is in terms of electrical capacitance, a method having the widely recognized advantages of mass, rather than volume indication.

The system operates on the principle of a continuously rebalanced bridge circuit in which the capacity of the tank unit, or sensing element, is constantly compared with a fixed reference capacitor. The voltage signal caused by any resulting difference in capacitance is then amplified sufficiently to operate a motor-driven potentiometer, restoring the system to balance and providing a reading of fuel quantity.

Unique design of the Simmonds tank unit provides a linear indicator reading, regardless of fuel tank geometry and shape, a factor of utmost importance to satisfactory operation of important auxiliary devices such as totalizers and fuel compensators.

Only two vacuum tubes are required to operate the Pacitron gage system, thus reducing to a minimum the number of elements most susceptible to failure. The heavy-duty, long-life tubes used, further add to circuit reliability under arduous flight conditions.

The amplifier housing the tubes is completely interchangeable with the bridge calibrator through a plug-in arrangement, simplyfying in-flight replacement of amplifier. A hermetically-sealed motor-driven indicator is provided with the Pacitron system.

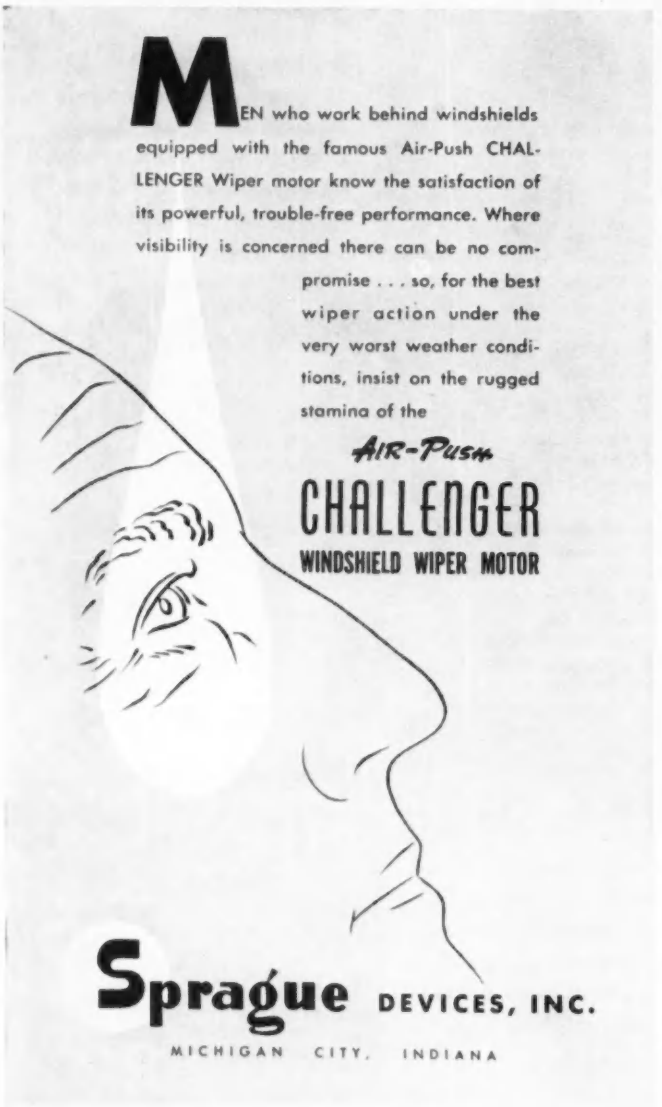
"Spot-on" adjustment in the manufacturing stage assures satisfactory tank unit interchangeability. Tank units, which are insulated throughout with "Teflon," can be top or bottom mounted, and positive connections may be made without removing access plates, or employing vulnerable pigtail connections.

U-19—400-Cycle Converter

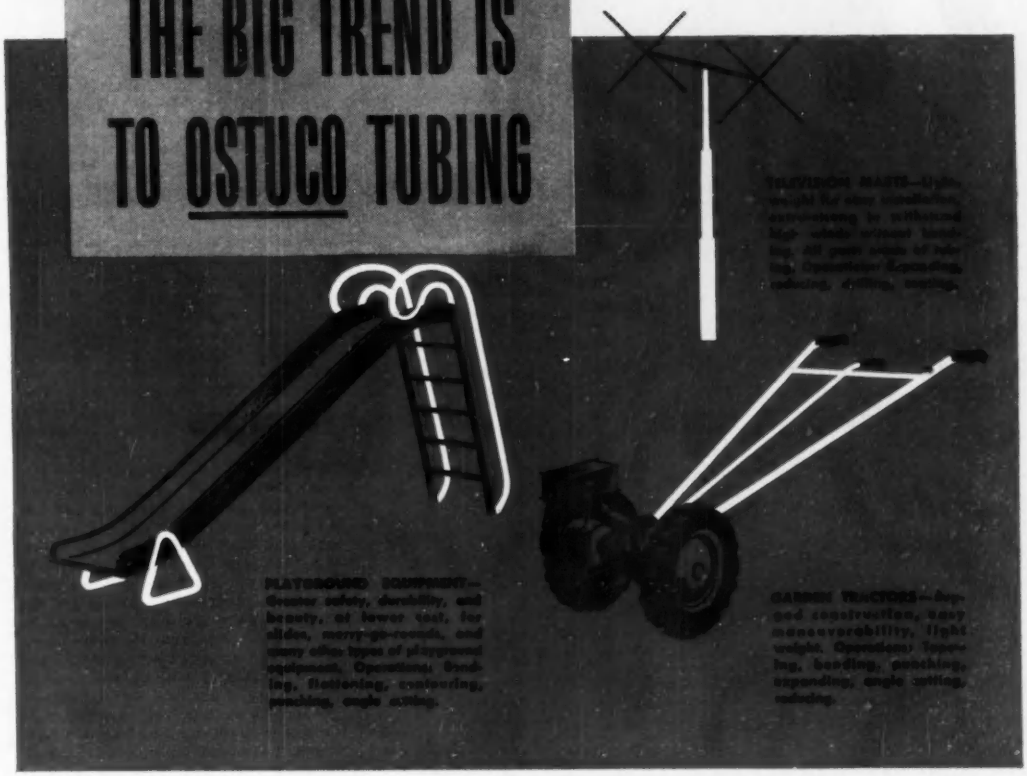
Large economies in space and weight in servo-mechanisms and electronic and electrical apparatus are provided by a new 8½-oz 400-cycle converter brought out by the industrial division of Minneapolis - Honeywell Regulator Co., Phila., Pa.

The 400-cycle converter can be used with any system involving the conversion of low-power direct voltage signals as low as one microvolt to 400-cycle alternating voltages, and will function at high altitudes in various electronic and electrical apparatus and in servo-mechanisms for aircraft and guided missiles. Its application extends to geological and geophysical survey equipment, radar, computors, transformers and other equipment.

The converter, having over-all dimension of 4¾ by 3 9/16 in., is useful for voltage error measurements or null detection, such as in computing devices in which direct voltage signals are converted to 400 cycles, amplified and then rectified. The resulting signal is used to actuate meters, bridges or other indicating devices.


MEN who work behind windshields equipped with the famous Air-Push CHALLENGER Wiper motor know the satisfaction of its powerful, trouble-free performance. Where visibility is concerned there can be no compromise . . . so, for the best wiper action under the very worst weather conditions, insist on the rugged stamina of the
AIR-PUSH
CHALLENGER
WINDSHIELD WIPER MOTOR
Sprague DEVICES, INC.
MICHIGAN CITY, INDIANA

THE BIG TREND IS TO OSTUCO TUBING



Manufacturers by the hundreds are stepping up sales appeal of their products by using steel tubing to improve design, increase strength, reduce weight, enhance beauty, and cut cost. And as competition grows, more and more users of tubing are switching to OSTUCO Tubing. The reasons are obvious.

Complete modern facilities for performing all three basic tubing operations—manufacturing, shaping, and fabricating—at one plant, enable OSTUCO to provide "Single Source Service" that inevitably speeds deliveries, boosts quality, and reduces final costs.

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OSTUCO produces both seamless and electric welded steel tubing in a broad range of sizes and shapes . . . performs *all* types of forging and fabricating operations . . . supplies finished or semi-finished products. Write direct or to our nearest sales office for informative free booklet "Fabricating and Forging Steel Tubing."

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FAIRFIELD MANUFACTURING CO.
319 SOUTH EARL AVENUE LAFAYETTE, INDIANA
For FINE GEARS

British Gas Turbine Locomotives

(*Continued from page* 41)

current for all the auxiliaries and for two of the traction motors for local maneuvering.

The gas turbine has a single combustion chamber with a replaceable liner. Air supplied by the compressor (C) on illustration), passes through the heat exchanger (D) where it is preheated and delivered to the combustion chamber. Fresh air is drawn through openings in the sides of the locomotive and connected to the air intakes of the compressor by two ducts. The casing of the multi-stage axial flow compressor is of cast steel and rests on an auxiliary frame which also carries the gas turbine and the generator with gear. Fuel is delivered by a separate pump set and sprayed into the combustion chamber by a single centrally located injection nozzle.

A slotted roof of stainless steel covers the heat exchanger. All parts of the power unit are lagged and covered with aluminum sheeting. A single pair of helical gears is employed for driving the generator, axial thrust being taken by a special collar. The turbine and the air compressor are each supported by two journal bearings, the compressor end being a combined journal and thrust bearing to take up any residual axial forces of the set. All bearings of the turbine-electric unit are pressure lubricated by oil supplied from a direct-driven, gear-type oil pump located in the main gear case. Fin-type oil coolers are mounted in the air intake openings in the sides of the locomotive.

Main technical data of the gas turbine power unit at full load are:

Compression delivery pressure	36 psi
Gas turbine inlet temp	1100 F
Temp of exhaust at atmosphere, approx	480 F
Turbine and compressor speed	5800 rpm
Generator speed	875 rpm
Input at generator coupling	2500 hp
Overall thermal efficiency	16.9 %
Fuel consumption	0.87 lb per hp-hr

When the order for the locomotive described above was placed, near the end of 1946, arrangements were made with the Metro-Vickers Co. to design and build a more powerful British gas turbine locomotive in which would be incorporated the newly acquired knowledge from experience with aircraft jet engines. This second locomotive is said to be well advanced but there is no indication when it will be ready for service.

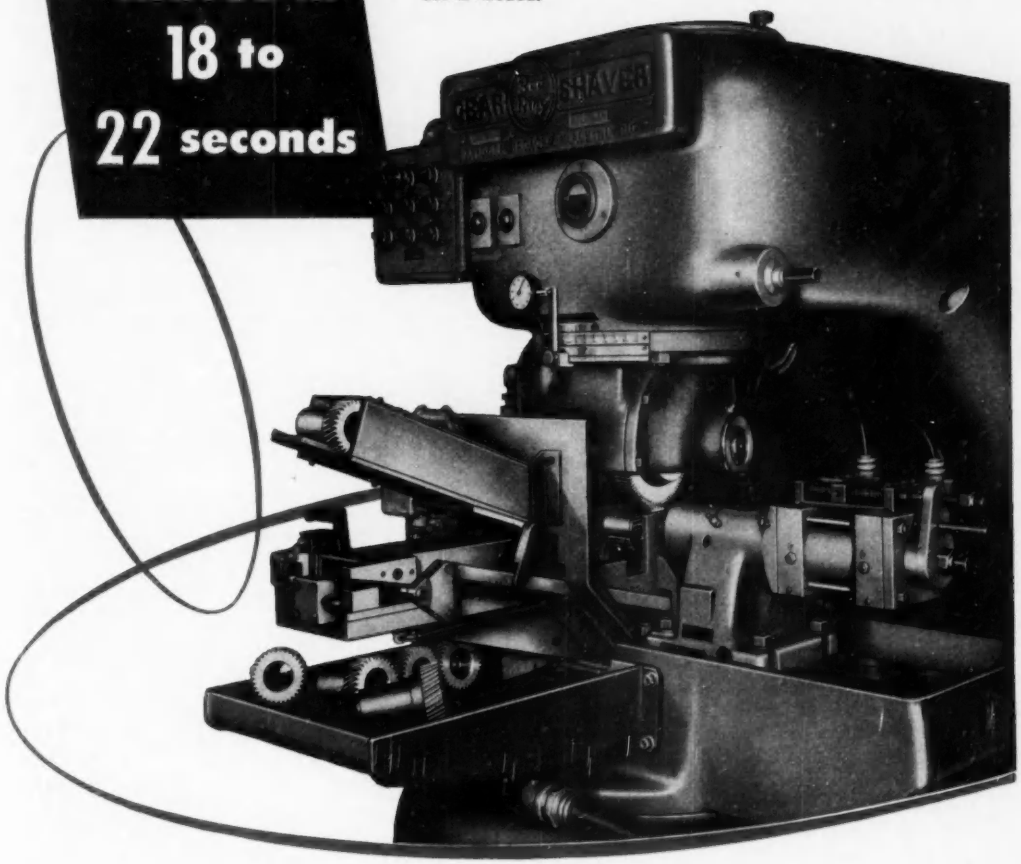
Transmission Gears

shaved in 18 to 22 seconds

The gear on this automatic transmission reverse drive sleeve is 2⅝" in diameter with a ⅞" face, 33 teeth and 14 normal D.P.

It is being shaved on this Red Ring Diagonal Gear Shaving Machine equipped for fully automatic loading at a rate of from 165 to 200 per hour, removing .0025" to .0015" of stock on tooth thickness. Rates up to 300 per hour have been recorded on smaller automotive transmission gears.

Automatic loading gives you not only the highest production rates, but it also minimizes operator fatigue and assures extremely close tolerance gears with ordinary machine operators—no special skill is needed.



WRITE FOR DESCRIPTIVE LITERATURE ON RED RING GEAR SHAVING AND AUTOMATIC LOADING

SPUR AND HELICAL GEAR SPECIALISTS ORIGINATORS OF ROTARY SHAVING AND ELLIPTOID TOOTH FORM

NATIONAL BROACH AND MACHINE CO.

5600 ST. JEAN . . . . . DETROIT 13, MICHIGAN

WORLD'S LARGEST PRODUCER OF GEAR SHAVING EQUIPMENT

100,000 Valve Guide Bushings per Day

(*Continued from page* 40)

ing plungers at the start of each cycle. Each piece feeds out to a stop and then is gripped by the collet in machining position.

In this battery of Acmes, spindle speed is 2800 rpm and there are six duplicate tools, each of which turns an oil seal groove, after which all six pieces are pushed into pick-off collets. This operation is performed only on inlet valve guide bushings. Each machine handles 3400 pieces an hour. Tools for grooving are of solid carbide and cut a groove 0.240 in. wide and 0.220 in. deep. The tools produce small radii at the top of the groove and a radius of 0.04 in. at the bottom of the groove.

All bushings (both inlet and exhaust) are next put through Cincinnati centerless grinders which hold the OD between 1.0305 and 1.0300 in. Despite this small tolerance, about 95 per cent of the output is within ±0.0001 in. Wheels used in this operation are 20 x 6-in. 60-grain grade M aluminum oxide with vitreous binders.

Workpieces coming from this grinder are transferred in baskets to Hoern & Dilts boring machines. These are rotating, ten-spindle machines. The loading station of one such machine is shown in Fig. 4. At these vertical boring machines, pieces are loaded and unloaded by hand, two at a time, in diaphragm chucks that stop automatically at the loading station and then proceed without stopping through the remainder of the cycle while semi-finish boring is being done. Spindle speed is 3200 rpm.

Tools used in this machine have a solid carbide shank, for maximum rigidity. Tips also are carbide, brazed to the shank. With these tools, 0.010 to 0.012 in. of metal is removed. Tools are held on slides that are moved down and up during the cycle. Limits held in this boring are 0.3431-0.3439 in. and 1300 pieces an hour are bored per machine.

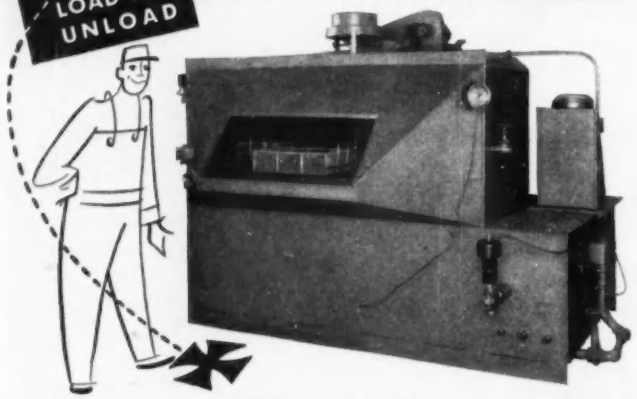
Finish machine boring of bushing holes is done in horizontal Ex-Cell-O machines, Fig. 5, having two horizontal hollow spindles that are supplied with bushings from magazines at the rear. Formerly, the magazines were fed automatically via tubes from an overhead conveyor but troubles encountered with this feed have resulted in a shift to hand loading of the magazines. With such loading, however, a single operator tends two machines, as their operation is entirely automatic.

From the magazines, the bushings are advanced small-end-forward through the hollow spindles by hydraulic plungers against stops that are fed down from above and retract automatically after the workpieces are gripped by the diaphragm chucks. Chucks do not stop while loading. They rotate at 3800 rpm while the boring tools are advanced. These tools have carbide shanks, for rigidity, as well as carbide tips and are supported in rigid slides. They remove only 0.010 to 0.012 in. of metal and bore 480 pieces an hour per machine. Although ±0.0004 in. tolerance is allowed in final boring of the hole, the limits commonly held are ±0.0002 in.

The final operation on the bore is done with a horizontal reamer turning at 1200 rpm. Bushings are held by hand, being pushed over the solid carbide reamers. These reamers, some of which have been used for as many as 350,000 bushings, remove from zero to 0.0003 in. of metal, depending, of course, upon the size of the hole produced in Ex-Cell-O boring. If this hole

ONE MAN OPERATION with BLAKESLEE METAL PARTS WASHERS

ONE SPOT LOAD and UNLOAD



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Just one man can keep the production line going with this time saving metal parts washer. Turn table operation permits loading and unloading in one easy pivot movement. One revolution of the washer turn table and parts come out sparkling clean for a better finishing job with fewer rejects. Blakeslee washers are designed for every type and size of plant operation. Write for the cooperative services of our engineer-trained sales representatives.

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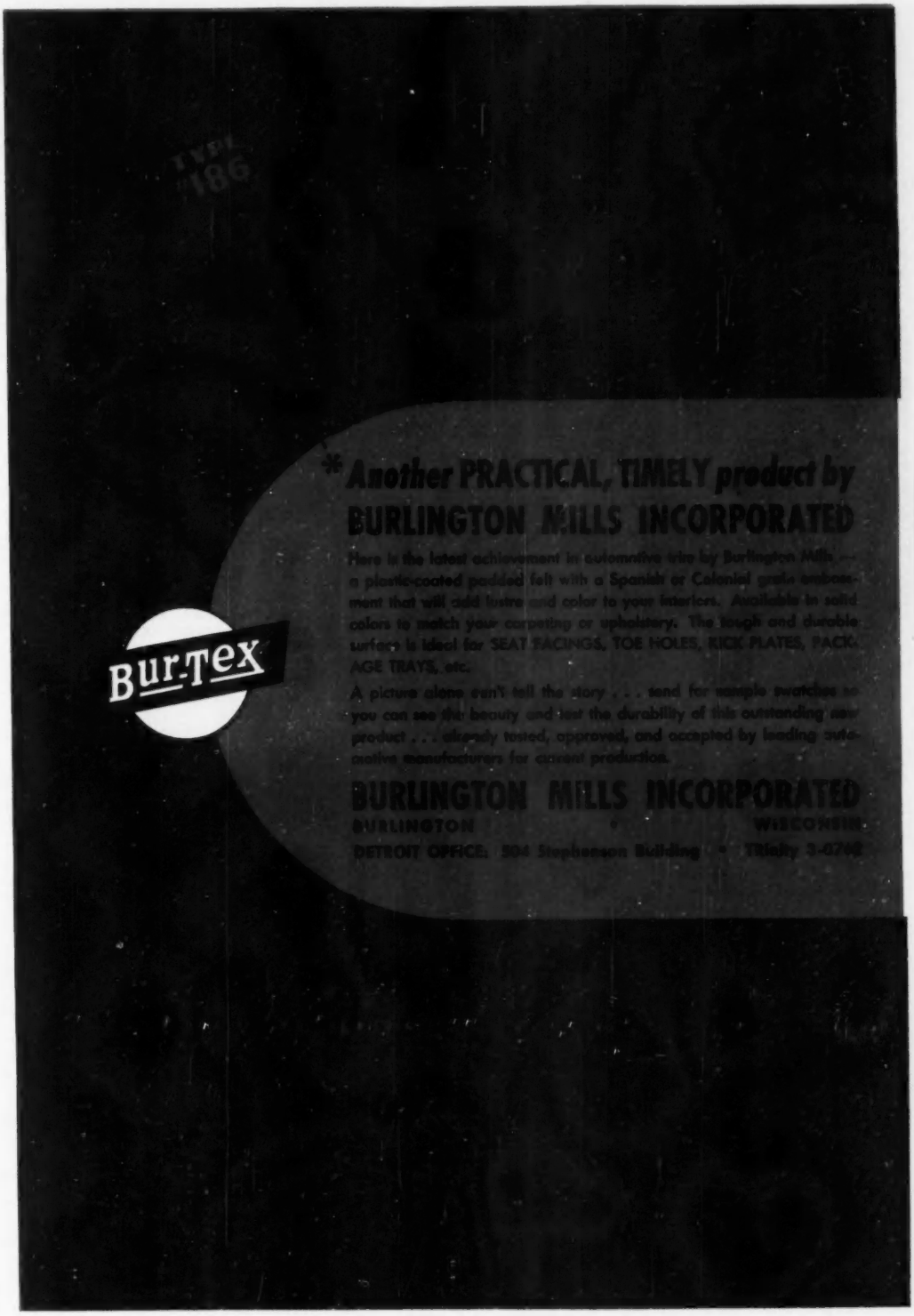
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A picture alone can't tell the story . . . send for sample swatches so you can see the beauty and test the durability of this outstanding new product . . . already tested, approved, and accepted by leading automotive manufacturers for current production.
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Valve Guide Bushings

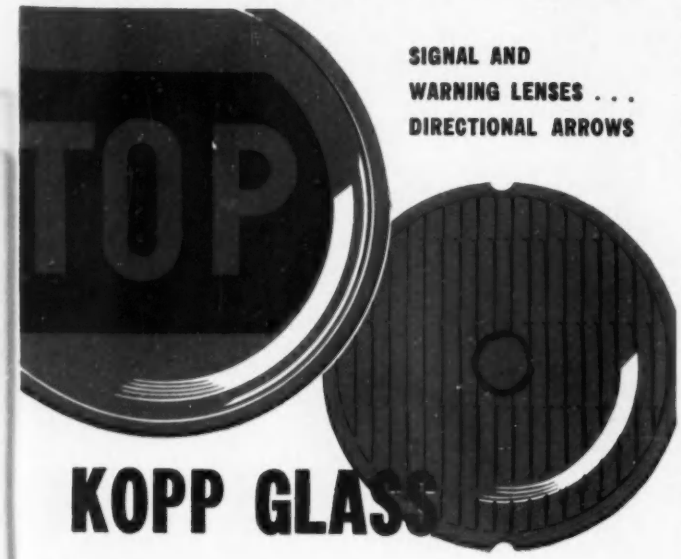
(*Continued from page 92*)

is under size more than 0.0003 in. the operator cannot hold the bushing against turning and the workpiece is rejected until rebored.

Parts coming from the reaming operation are loaded in aluminum trays holding 198 bushings. Two parts in each tray are marked for identification by the reaming operator and are placed wrong end up. Inspection can thus trace rejects to the operator responsible. Trays go to a final inspection bench where nine pieces are picked at random from each tray for checking critical dimensions. If one part is found outside of specified limits, the whole tray is rejected. Despite this, a rejection rate below 0.5 per cent is attained. The rate has been reduced gradually from around 3 to 4 per cent to the present low rate partly because of frequent spot checking and the use at many inspection stations of quality control charts that show quickly any tendency for sizes to go outside the limits set before these limits are reached.

After trays of parts pass inspection, they go to the Stevens machine, Fig. 6, for cleaning and phosphating. Handling trays are inverted to transfer the parts from these trays to stainless steel trays employed for the treatment on the conveyor. These trays are loaded on carriers hanging from the conveying arms that advance the trays through the successive dips in a 60-min cycle. The first dip is in kerosene and is followed by rinsing in cold and then in hot water before the parts enter the Parko treating tank where the phosphating is done. This treatment provides a porous coating that not only inhibits rust but absorbs oil in the subsequent and final dip.

At the end of the conveyor, the stainless trays are inverted to return the parts to aluminum trays which are then loaded on pallets that hold, in all, 11,788 bushings. Loaded pallets are subsequently transferred to the Ford engine assembly plant or parts service department. When trays are emptied, they are returned to the department whose work is here described.



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DIRECTIONAL ARROWS

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As the element in the vehicle signal system through which the signal is flashed, the lens must be of highest quality if the system is to function dependably. Kopp glass lenses have every characteristic you want. They are correctly engineered and made, and are accurate in color, size and design. They are non-fading, durable and have high-transmission properties.

Maintain high-quality throughout every component part of your vehicles by specifying Kopp Glass signal lenses, warning lenses and directional arrows. They may be secured from leading makers of vehicle signal equipment.

KOPP GLASS, INC.
SWISSVALE, PA.

KOPP GLASS

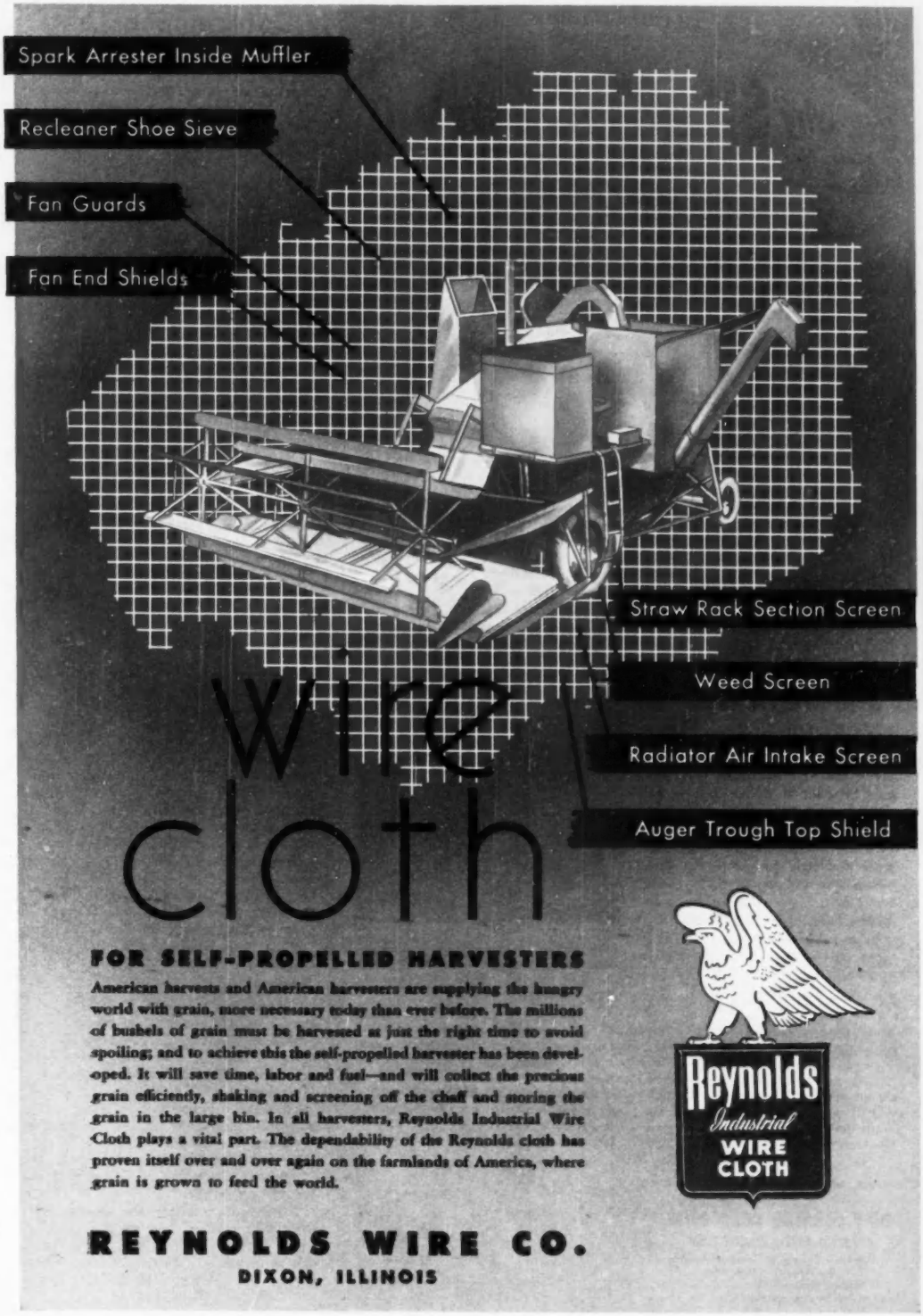
New Type Stainless Powder

Two grades of stainless powder, one essentially a 14 per cent chromium, balance iron, referred to as grade 140 and the other a 17-18 per cent chromium, 8-9 per cent nickel composition, referred to as grade 188 are now being made by a new method. The following characteristics are reported for these metals.

Grade 140 develops higher densities and superior physical properties than grade 188 for equivalent pressing and sintering treatments. A commercially feasible cycle consisting of pressing at 35 psi followed by sintering one hour at 2372 F develops an ultimate tensile strength in the case of grade 140 of 30,250 psi and an elongation of 7.8 per cent. For grade 188, treated similarly, these properties become 19,875 psi ultimate tensile strength and 6.0 per cent elongation.

Where re-pressing and resintering are applied, the physical properties are appreciably improved. Thus, for the same bars pressed at 70,000 psi and sintered one hour at 2372 F, re-pressing at 80,000 psi followed by resintering for one hour at 2372 F results in increasing the ultimate to 48,650 psi and the elongation to 15.8 per cent for grade 140, and these properties to 31,800 psi ultimate and 11.8 per cent elongation for grade 188.

These bars when tested for salt spray resistance after sintering were found excellent in this regard. They were also found resistant to 30 per cent nitric acid, cold or hot. While the grade 188 powder is magnetic as prepared, it is non-magnetic and completely austenitic after sintering one hour at 2372 F. The new stainless powders are produced by the American Electro Metal Corp., Yonkers, N. Y.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American harvests and American harvesters are supplying the hungry world with grain, more necessary today than ever before. The millions of bushels of grain must be harvested at just the right time to avoid spoiling; and to achieve this the self-propelled harvester has been developed. It will save time, labor and fuel—and will collect the precious grain efficiently, shaking and screening off the chaff and storing the grain in the large bin. In all harvesters, Reynolds Industrial Wire Cloth plays a vital part. The dependability of the Reynolds cloth has proven itself over and over again on the farmlands of America, where grain is grown to feed the world.
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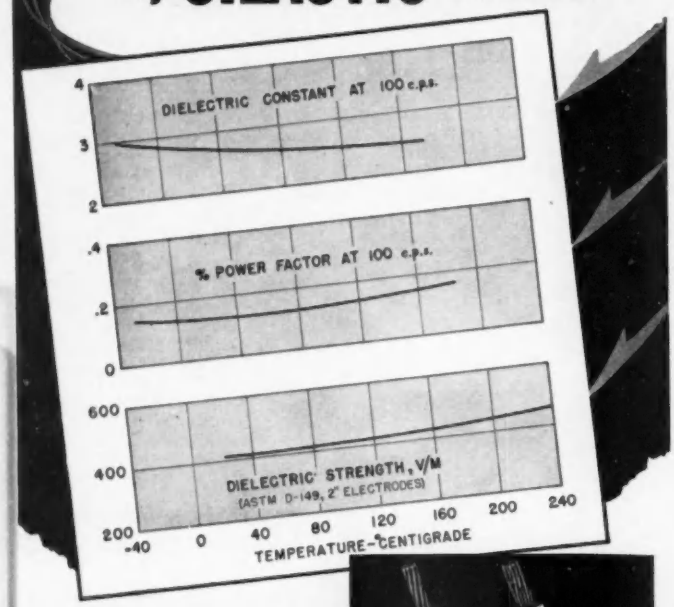
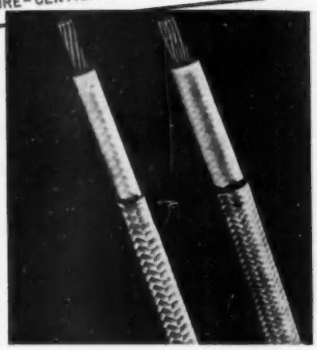
why SILASTIC* works best



as a dielectric material from −100° to +500°F.

Over that wide temperature span only Silastic, the Dow Corning Silicone Rubber, remains resilient and retains high resistance to weathering, moisture, oxidation and ozone. Add good dielectric properties to those advantages and you have the reasons why Silastic is an excellent insulating material for high temperature, high voltage cable and for use in equipment where mechanical breakdown limits the effectiveness of resinous insulating materials.



Silastic is extruded over wire and cable ranging in size from No. 22 to 500,000 circular mils to provide insulation at temperatures from −80° to 400° F.*

Many engineers are familiar with Silastic as a remarkably heat stable and oil resistant rubberlike gasketing and sealing material for use between −100 to 500° F. Silastic as a dielectric for ignition and intercommunication cable and for field and armature coils is, however, a relatively new development. That's why Dow Corning has made available reprints of a recent article giving the most up-to-date information on the physical, chemical and dielectric properties of Silastic. To receive your copy, phone the nearest branch office or write for Reprint No. C-21.

*T.M. REG. U.S. PAT. OFF.

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Dow Corning
FIRST IN SILICONES

Determining Drag

(*Continued from page* 43)

inertia of the decelerated wheels. This weight, determined by a pendulum method, was found to be 170 lb for the set of four wheels. Hence

$$W_{eff} = 3770 \text{ lb.}$$

Fig. 1 shows the measured values of total drag of the automobile.

Drag of a car consists of an aerodynamic component, the rolling drag of the tires, and a mechanical amount. At $V \rightarrow O$, the aerodynamic drag is zero. Deceleration tests between 5 mph and zero thus indicate the sum of rolling and mechanical drag, at $V \rightarrow O$. The mechanical component is equivalent to the friction losses within the wheel bearings (including those of the seals) and within the system of rear axle, torque tube and part of the transmission. This drag can also be measured by means of deceleration by jacking up the rear axle, bringing the wheels to a suitable speed by the engine, then putting the transmission into neutral and measuring the deceleration of the system by means of the speedometer and a stopwatch.

The resulting plot of speed against time is differentiated in order to get the deceleration b, and the mechanical drag is found according to

$$D_{mech} = \Delta W \frac{b}{g}$$

This drag depends partly upon the temperature within the rear axle, the transmission, and the involved bearings. The tests plotted in Fig. 1 were run after the mechanical system of the car was warmed up by driving around for some time. The atmospherical temperature was around 60 F. The mechanical drag consists of a constant and a component increasing approximately in proportion to the speed.

Drag of the front wheels, including that caused by the seals, was found in a similar manner. Both these and the rear wheels, however, are practically without any load during the described stand tests. The additional amount of drag, attributable to the weight of the car was accounted for by

$$\Delta D_{mech} = 0.001\ W \approx 3.5 \text{ lb}$$

as found for roller bearings in competent handbooks, independent of the speed. The total of the mechanical drag shown in Fig. 1, is considerable; in the order of 15 to 20 per cent of the total drag. Most of this drag could be considered part of the propulsive system of the vehicle. On the average, the corresponding loss of power is roughly in the order of 10 per cent of the engine power.

After substracting the mechanical drag, the rolling drag of the tires is found for $V \rightarrow O$. Fig. 2 shows how this drag varies with the inflation pressure. The variation of the tire drag

(*Turn to page* 100, *please*)

Arched Spring Prongs

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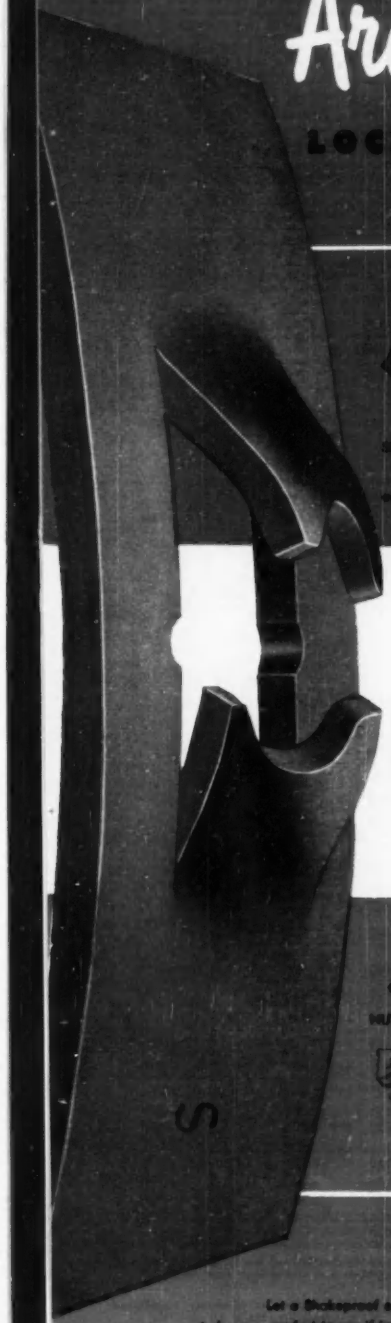

FLAT TYPE

Shakeproof SPEED NUTS combine all the features of threaded nuts—and actually grip the screw when tightened!

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Light and easy to handle, they hold themselves in screw-receiving position at panel edges, to speed assembly.

"J" TYPE

Also self-retaining, design modifications like this embody specific advantages and reduce weight still further.

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For difficult blind fastening problems and panel fastening, they deeply "clip" nuts in place.

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Speed Nuts*

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Which of these Dilecto Grades Can Meet Your Requirements?

ELECTRICAL AND MECHANICAL PROPERTIES OF DILECTO SHEET GRADES, APPROXIMATE AVERAGE VALUES

NEMA Grade	Continental-Diamond Grade (sheets) DILECTO	Lbs./cu. in.	Specific Gravity	Water Absorption %, 24 hrs.	Rockwell Hardness "M"	Tensile Strength Thousands of psi LW	Tensile Strength Thousands of psi CW	Flexural Strength Thousands of psi LW	Flexural Strength Thousands of psi CW	Compression Strength, thousands psi (Flat.)	Bonding Strength, lbs. (1)	(1) Impact Strength (Izod) Notched in ft. lbs. per 1" of Notch Flatwise LW	Flatwise CW	Edgewise LW	Edgewise CW	Dielectric Strength in Volts per Mil Short Time	Dielectric Strength in Volts per Mil Step by Step	(2) Power Factor 10^6 cycles /seconds As Recd.	(2) Power Factor 10^6 cycles /seconds Wet	(2) Dielectric Constant 10^6 cycles /seconds As Recd.	(2) Dielectric Constant 10^6 cycles /seconds Wet	(2) Loss Factor 10^6 cycles /seconds As Recd.	(2) Loss Factor 10^6 cycles /seconds Wet
X	X-13	.0497	1.38	2.0	110	15	12	30	22	42	1100	2.5	2.0	0.70	0.60	750	530	0.039		5.10		0.20	
P	XP-13	.0497	1.38	1.5	100	11	10	20	16	26	900			0.60	0.50	575	400	0.036	0.04	4.6	5.2	0.17	0.21
	XP-90	.0476	1.31	2.5	45	9.7	7.2	12	10	19				1.00	0.70	600	400	0.035		5.5		0.30	
XXP	XXP-13	.0497	1.38	0.9	110	10	8	17	14	27	1000			0.50	0.45	750	530	0.030	0.034	4.3	4.5	0.13	0.15
XXXP	XXXP-13	.0497	1.38	0.5	110	9	7.5	16	12	27	1100			0.40	0.35	700	500	0.026	0.028	4.2	4.4	0.11	0.12
	XXXP-22	.0466	1.39	0.3	115	12	10.5	13.5	12	27.5				0.379	0.338	810	675	0.024	0.027	4.09	4.2	0.10	0.115
	XXS	.0497	1.38	1.5	100	12	10	19	17	34	950	1.1	1.0	0.50	0.45	700	500	0.038	0.042	5.2	5.4	0.20	0.23
XX	XX-13	.0497	1.38	0.9	110	12	10	19	17	34	950	1.1	1.0	0.50	0.45	700	500	0.038	0.039	5.2	5.3	0.20	0.21
XXX	XXX-13	.0497	1.38	0.7	115	11	10	19	16	36	1200	0.9	0.85	0.45	0.40	650	470	0.034	0.035	4.8	4.9	0.16	0.17
	XXARC	.0497	1.38	3.0	100																		
	XXHV	.0497	1.38	1.3	110	10	8	17	15	27	950					600	450	0.033	0.039	4.7	4.8	0.16	0.19
	CBW	.0497	1.38	1.9	100	12	10	19	18														
A	A-13	.0614	1.70	0.8	100	10	7	18	16	38	900	1.9	1.8	0.9	0.8	200	120	0.115		5.2		0.60	
AA	AA-13	.0560	1.55	0.7	110	10	6.5	19	15	40	1800	5.0	4.1	4.5	4.0	75	45	0.44		6.8		2.99	
	MAA	.0639	1.77	5.3	108	7.4	6.5	13	12	45	1300	6.0		4.0		35	27	0.57		13.4		7.7	
	FA-72	.0578	1.60	0.7	115	21	17	38	27	48	1400	5.0	4.0	2.5	2.0	70	50						
	MA	.0650	1.80	1.2	115	10	6	17	13	40	900	1.3	1.1	0.85	0.75	150	80	0.11		8.2		0.90	
	CF	.0497	1.38	0.8	100	11.5	9.5	22	22	38.5				2.0	1.6	200	125						
C	C-813*	.0497	1.38	1.0	110	11	9	21	19	40	2000	3.6	3.5	2.4	2.1	200	120	0.065		6.0		0.36	
	MC	.0524	1.45	3.0	107	9.5	7.9	17	16.6	39				1.4		300	200	0.07	0.17	8.4	15.5	0.59	2.70
	CV	.0497	1.38	0.8	115	9	8	20	18	40	2200	2.4	2.3	1.5	1.4								
CE	CE-800	.0497	1.38	0.8	115	9	8	20	18	38	2200	2.4	2.3	1.5	1.4	380	265	0.050	0.058	5.2	5.6	0.26	0.33
L	L-400*	.0497	1.38	0.9	110	12	9.5	23	18	39	1900	3.3	3.0	1.4	1.3	200	120	0.065	0.072	6.0	6.3	0.39	0.45
	ML	.0524	1.45	2.0	110	13.5	9.1	22	15	39				0.7		325	230	0.07	0.20	8.4	8.95	0.59	1.79
LE	LE-13	.0497	1.38	0.7	115	10	8	21	17	40	2000	2.5	2.0	1.5	1.1	450	290	0.045	0.050	4.8	5.2	0.22	0.26
	LDC	.0497	1.38	0.6	115	9	7.5	20	16	40	2000	2.5	2.0	1.5	1.1								
	GB-112-M†	.061	1.69	3.0	114	22	20			43						600	400	0.018		7.0		0.126	
	GB-112-D†	.060	1.65	2.5	110	33	30			38						900	700	0.018		5.0		0.090	
G5	GB-128-M	.0686	1.90	2.2	110	25	22	40	38	50	1700	17.5	16.5	14.0	13.0	300	330	0.013		7.2		0.094	
G3	GB-128-D	.0578	1.60	0.6	95	24	15	21	19	44	1500	10.0	7.0	8.0	7.0	600	390	0.025	0.04	4.9	5.3	0.13	0.21
G1 & G2	GB-261-D	.0542	1.50	0.6	105	15	11	22	19	39	1200	9.0	5.5	8.0	1.0	425	360	0.011	0.02	4.2	4.3	0.046	0.086
	Diamond Black	.0506	1.40	11.0	90	15	9	24	20	38	1000	7.0	5.5	1.5	1.4	600	390	0.055	0.080	6.0	6.5	0.33	0.52
	MEC-5	.0423	1.17	0.2	100	6.7	5.7	11	9.5	48	850	5.5	4.0	3.0	2.0	370	340	0.016		4.43		0.071	
	GB-112-S	.0614	1.70	.15		19		27		31	960			7.2	5.5	325	300	0.002	.013	3.9	4.6	0.008	0.060
	GB-128-S	.0614	1.70	.15		18		23		46	800			12	10	250		0.002		3.9		0.008	
	GB-261-S	.0614	1.70	.20		22		24			990			9.5	8.0	150		0.002		3.9		0.008	

NOTES: All tests, except "blistering temperature," were conducted in accordance with American Society for Testing Materials Methods for Sheet Electrical Insulation.

*These Grades approximate the physical properties of Celoron.

†These grades are made principally in the thicknesses from .010" to .025". The data shown is for .025" thick sheet.

(1) Flatwise impact test and bonding strength values are based on 1/2" thick material. All other tests are based on 1/8" thick material except the values for grade XXARC, which are based on 1/32" thickness.

(2) Wet power factor, dielectric constant, and loss factor values are based on samples which had been immersed in fresh water for 24 hours at 25° ± 2° C.

(3) Insulation Resistance values were determined on samples conditioned for 96 hours at 90% ± 2% relative humidity at 35° ± 1° C.

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STANDARD SIZES OF DILECTO SHEETS . . . TUBES . . . RODS

Blistering Temp. °C.	Blistering Temp. °F.	Arc Resistance in Seconds	Insulation Resistance, Megohms (3)	Deformation under Load in %	Colors (4) and Finish (5)	SHEETS		TUBES						MOLDED RODS Lengths Approx. 39" to 45"	Continental-Diamond Grade (sheets) DILECTO
								MOLDED Lengths Approx. 18" to 144" (8)			ROLLED Lengths Approx. 18" to 96"				
						Thickness in Inches Inclusive	Approximate Size in Inches	Min. (7) Wall Thickness, Inches	I. D. in Inches Inclusive	O. D. in Inches Inclusive	Min. (7) Wall Thickness, Inches	I. D. in Inches Inclusive	O. D. in Inches Inclusive	Diameter in Inches Inclusive	
220	428	10	90		Black, Natural, Nat. core with Black surfaces	.010—2	36 x 42 38 x 38 38 x 43 38 x 96 39 x 46 46 x 70 except thicknesses under 1/32" made only in 38 x 38 and 38 x 43 sizes XXARC-XXABC	1/16	1/8—9	1/4—9-1/2	1/32 (6)	1/8—48	3/16—50	not made	X-13
240	464	10	100		Black, Natural, Nat. core with Choc. surfaces	.010—1/4		not made			not made			not made	XP-13
240	464	7	35		Natural	.010—1/4		not made			not made			not made	XP-90
220	428		500		Blk., Nat. Choc., Nat. core with Brown surfaces	1/64—1/4		not made			not made			not made	XXP-13
220	428	4	2000		Black, Natural	1/64—1/4		not made			not made			not made	XXXP-13
240	464	9	9400		Natural	1/64—1/4		not made			not made			not made	XXXP-22
230	482	4			Black only	1/32—2		not made			not made			not made	XXS
250	482	4	500	0.77	Black, Natural	.010—2		1/16	1/8—9	1/4—9-1/2	1/32 (6)	1/8—48	3/16—50	1/8—2 (9)	XX-13
240	464	4	800	0.65		1/64—2	38 x 38 and 38 x 43 only	1/16	1/8—9	1/4—9-1/2	1/32 (6)	1/8—48	3/16—50	1/8—2 (9)	XXX-13
		10	139		Olive Green	1/64—1/4		not made			not made			not made	XXARC
		10	100		Black, Natural	1/64—2		not made			not made			not made	XXHV
					White core, Blk. surfaces; alternating Blk. and White layer or Blk. surfaces	1/32—1/4	38 x 38	not made			not made			not made	CBW
220	428	4			Natural	.025—2	38 x 38 and 38 x 43 except Grade A 36 x 38 36 x 43	1/16	3/16—9	5/16—9-1/2	1/16	3/16—48	5/16—50	1/4 to 2 (10)	A-13
270+	518+	4				1/16—2		1/8	3/8—9	5/8—9-1/2	1/8	1—48	1-1/4—50	1/2 to 2	AA-13
300+	572+	75	.25	.90	Gray	1/16—2		1/8	3/8—9	5/8—9-1/2	1/8	1—48	1/4—50	1/2—2	MAA
		4			Natural	.025—2		1/16	3/16—9	5/16—9-1/2	1/16	3/16—48	5/16—50	1/4 to 2 (9)	FA-72
230	446	80	5		Gray	.025—2	36 x 36	1/16	3/16—9	5/16—9-1/2	1/16	3/16—48	5/16—48	1/4 to 2 (9) (10)	MA
200	392	4	10	1.3	Natural	1/32—3/8	38 x 38 38 x 43 39 x 46 39 x 70 46 x 70	not made			not made			not made	CF
230	446	4	25	1.3		.025—10	38 x 38 38 x 43 39 x 46 39 x 70	1/16	1/4—9	3/8—9-1/2	1/16	3/8—48	1/2—50	1/4 to 4	C-813*
215	419	80	1.4	1.7	Gray	.025—2	38 x 43	1/16	1/4—9	3/8—9-1/2	1/16	3/8—48	1/2—50	1/4 to 4	MC
240	464	4			Natural	1/32—2	36 x 42 38 x 38 38 x 43 38 x 96 39 x 46	not made			not made			not made	CV
240	464	4	100	0.90	Black, Natural, except CV—Natural only	1/32—2		1/16	1/4—9	3/8—9-1/2	1/16	3/8—48	1/2—50	1/4—4	CE-800
220	428	4	25	1.3		.010—2		1/32	1/8—9	3/16—9-1/2	1/32	3/16—48	1/4—50	3/16—4	L-400*
		95	9.7	1.4	Gray	.015—2									ML
	446	4	100		Black, Natural	.015—2	38 x 38 38 x 43	1/32	1/8—9	3/16—9-1/2	1/32	3/16—48	1/4—50	3/16—4	LE-13
230	446	4			Natural	.015—2		1/32	1/8—9	3/16—9-1/2				3/16—4	LDC
270+		185	50	0.90	Brown	.010—.025	38 x 38 38 x 43								GB-112-M†
270+		4	20	0.50	Natural	.010—.025	38 x 38 38 x 43								GB-112-D†
270+	518+	185	50		Brown	.015—2	38 x 38 and 38 x 43	1/16	1/4—9	3/8—9-1/2	1/16	1/2—48	5/8—50	1/2 to 2 (10)	GB-122-M
270+	518+	4	25	0.30	Natural	.025—2		1/16	1/4—9	3/8—9-1/2	1/16	3/8—9	1/2—11	1/4 to 2	GB-122-D
270+	518+	4	500	0.58		1/32—2		1/8	3/8—9	5/8—9-1/2	not made			1/2 to 2 (10)	GB-261-D
250+	482+	100	10		Gray	1/32—2	39 x 46	1/16	1/2—9	5/8—9-1/2	1/16	1—48	1-1/8—50	not made	Natural Black
		7	10000	1.13	Natural	.010—1	38 x 38 38 x 43	1/32	1/8—4	3/16—5	not made			3/16—2	MEC-5
300+	572+	275	3000		Natural	.010—1/2	36 x 36 36 x 42								GB-112-S
300+	572+	275	800		Natural	1/32—1/2	36 x 36 36 x 42								GB-122-S
300+	572+	275	5.7		Natural	1/16—1/2	36 x 36 36 x 42								GB-261-S

(4) Natural Color varies from golden yellow to dark brown.
(5) Standard finishes are dull, semi-gloss or polished.
(6) The above specifications cover standard sizes regularly in production. Where your design requirements dictate, and our production facilities permit, other sizes can usually be made on special order.
(7) Maximum wall thickness is determined by inside diameter. Correspondence is invited on sizes where wall thickness is abnormally great.
(8) Lengths over 40 inches are available in a limited range of sizes.
(9) Diameters of 1" and over may have annular cracks.
(10) 36" lengths.

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Determining Drag

(*Continued from page 96*)

with the speed is known from various tests on drum stands. The following formula was found to approximate the rolling drag of conventional tires:

$$\frac{D_{Tire}}{W} = K_T = K_{T_o}\left(1 + \frac{2.5}{10^4} V^2_{mph}\right)$$

where K_{T_o} denotes the drag-load ratio at $V \rightarrow O$. Employing this equation and the data of Fig. 2, it is possible to calculate the tire drag for practically all speeds and inflation pressures.

After measuring and calculating, respectively, all the mechanical and tire-drag components, Fig. 1 permits determination of the aerodynamic drag of the tested automobile. This drag is expected to increase as the square of the speed. The corresponding parabola through the experimental points is

$$D_{Aero.\ lb} = 0.032\ V^2_{mph}$$

During the road tests the air density was $\rho = 0.0022$ slugs per cu ft. The non-dimensional aerodynamic drag coefficient is then

$$C_D = \frac{D_{Aero}}{0.5\ \rho\ V^2\ S}$$

$$= \frac{0.032 \times 2 \times 0.68^2}{0.0022 \times 26} = 0.52$$

where S equals 26 sq ft, the approximate projected solid frontal area of the car, and 0.68 is the conversion ratio between fps and mph. Wind-tunnel tests on carefully made models indicate coefficients between 0.2 for smooth and "streamlined" vehicles with faired undersides, and 0.7 for passenger cars of the blunt designs between 1920 and 1930. Thus, the aerodynamic progress in the automobile field does not appear to be very impressive up to the present time.

The deceleration method is quite suitable for determining drag differentials due to certain modifications. By running tests at the same speed (at 50 mph for instance) with and without antenna, rear-view mirror, sun visor, door handles, or other parts and accessories exposed to the wind, the respective differences in the aerodynamic coefficient are readily found. The accuracy of such tests can be assured by accumulating a number of test points. Applying this procedure, the Plymouth car was tested in addition to the condition in Fig. 1, with the windows and the cowl ventilator opened. The additional drag coefficient was but 0.02, so that the coefficient in this case is 0.54. The amount of 0.02 agrees with the result of a theoretical computation accounting for the loss of dynamic momentum of the volume of air entering through the ventilator into the car compartment.

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BOOKS . . .

EFFICIENT MILLING, published by *Metal Cutting Tool Institute*, 405 Lexington Avenue, New York 17, N. Y. This report is intended to help in selecting the best tool material and applying it in the most desirable way to a fixed or relatively inflexible set of conditions, such as machine, fixture, speed, feed, and cutter design. Much space is devoted to operating conditions and their effect upon cutter life. It also covers many aspects of cutter manufacture and maintenance as well as other details not directly related to the performance of the many tool materials.

COLORIMETRY, by *Deane B. Judd*, published by *National Bureau of Standards*, Washington 25, D. C. Price $0.30. The booklet describes the standards and measurement methods developed by the Bureau in the field of colorimetry, giving the basis for each technique and showing clearly how one method supplements the other. Chapters cover the following topics: standard observer; illuminants and coordinate system; small-difference colorimetry; material standards of color; one-dimensional color scales; and general methods. Ample illustrations and tables are provided.

MATERIALS ENGINEERING OF METAL PRODUCTS, by *Norman E. Woldman*, published by *Reinhold Publishing Corp.*, 330 W. 42 Street, New York, N. Y. Price $10.00. Advantages and disadvantages of all various types of metals and alloys in specific service applications are discussed in this book. Its purpose is to help the materials engineer select the type of metal or alloy which is best able to meet a given set of service conditions. Numerous tables and illustrations accompany the text.

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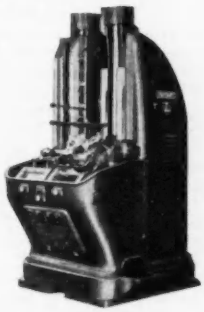

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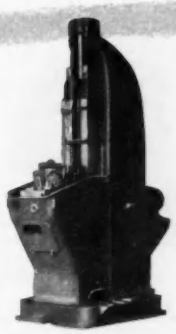

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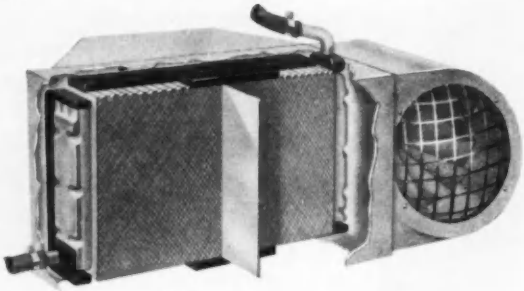

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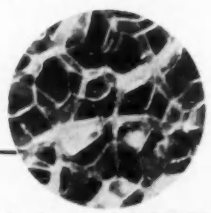

Photo-micrograph shows how each cell is completely sealed by a wall of rubber. The material cannot absorb moisture. It has high insulating values, is highly resistant to oxidation and is rot and vermin proof.

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1951 Packard Ultramatic Improvements

Supplementing the announcement of 1951 Packard cars (Sept. 1 issue, AUTOMOTIVE INDUSTRIES), the following complete outline of specific detail changes made in the Ultramatic drive to improve operation and service has been announced. A complete description of this transmission appeared in the May 1, 1949, issue of AUTOMOTIVE INDUSTRIES.

Additional grooves have been incorporated in the driven plate of the direct drive clutch to improve clutch release in cold weather and give quicker kickdown into converter stage. Cores for converter castings have been completely revised on the second turbine and reactor and are being revised on the pump and first turbine to give better form and finish to improve performance and efficiency. Rotors for oil pumps are being made of harder material to increase life. A new damper has been added to the planetary gear cage to provide a smoother and quieter direct drive, particularly at speeds between 15 and 25 mph.

Lubrication for the high range clutch has been improved through introduction of new steel back bushings and relocated oil holes. Revisions also have been made in the clutch housing design to facilitate cleaning. Low and reverse brake pistons now have a crown on the larger diameter and both diameters are chromium-plated to improve the bearing of pistons in the bores. In addition brake bands have been redesigned to permit fabrication from strip stock.

The governor vent valve has been revised by the addition of a different type of flat to assure freedom from foreign material. Development work on the governor drive has resulted in the use of a driving gear made of brass while the driven gear is being shaved to improve life. Oil is now conducted from the rear pump along the final drive shaft to the governor drive where it is thrown off directly into the gears.

The final drive shaft in the transmission has been lengthened to permit use of a shorter propeller shaft and is now ball bearing mounted for greater rigidity.

Aluminum die castings have replaced permanent mold castings used initially for hydraulic controls and valving. This change gives better form in the various passages and reduces the burring and cleaning operations formerly required. Adjustment of the control valve has been improved by introducing a solid link to replace the adjustable link formerly used. Frictional clamping of the detent lever to the shaft is employed to establish the initial adjustment which can now be made to the exact position of the valve.

Redesign of the direct shift valve and revisions in the pump selector valve

(*Turn to page* 108, *please*)

High-compression Engine Owners Switching to New Blue Sunoco

New High-test Gasoline gives New High Anti-Knock Power at Less Cost per Mile

USERS SAY:

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It all adds up to GREATER PROFITS FOR YOU

High-test at Regular Gas Price

Engine Design for Fuels and Lubricants

(*Continued from page* 45)

were not measured, it is obvious that with 60 F tap water flowing at 35 lb per hr, the water leaving the valve could not have been much above this value. This means that the temperature had been decreased between 600 F to 700 F at 1000 rpm.

A power and economy comparison, Fig. 3, was made of the nine to one compression ratio engine for the water cooled and uncooled valves. This comparison shows that the engine develops only slightly more power with the cooled valve over the range of 1000 to 2250 rpm, while the uncooled valve curve shows more power over 2250 rpm. Fuel economy for both valves is approximately the same over the entire speed range.

Fig. 4 shows a plot of maximum brake torque octane requirement versus engine speed. Under these equal power output conditions there is no significant difference in requirement at any engine speed, and the differences shown by these curves are within the limits of error of octane number measurement. Therefore, it is quite apparent from these data that cooling the exhaust valve does not result in an appreciable gain in mechanical octane numbers.

Compression Ratio, Octane Demand, and Lubrication

By R. J. S. Pigott,
Gulf Research and Development Co.

IT IS evident that the desire for higher specific output and better economy will continue the drive for higher compression ratios. Judging from earlier work, done mainly on racing engines, compression ratio is not likely to go higher than 13 to 1 or perhaps 14 to 1, because at these compression ratios difficulty with strangulation of the valves may cancel out the possible gains in bmep and efficiency. In addition, the gain from higher compression ratio is flattened out so much as to approach the vanishing point.

Factors Involved in Detonation

The temperature at the end of compression, whatever may be the cause, is probably the principal agent inducing detonation. Naturally this temperature is modified by local temperatures, higher than the average, and their relation to the flame front. Density has some effect, without doubt, but this is not nearly so important as the effect of temperature.

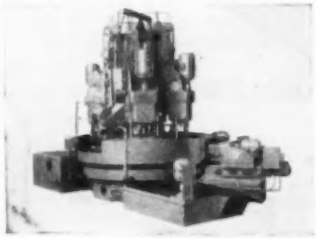
Compression pressure goes up as the 1.35 power of compression ratio; absolute temperature goes up as the 0.26 power of compression ratio. These values differ from true adiabatic, from the effects of jacket cooling and hot parts.

Turbulence, chiefly by the higher heat transfer due to higher velocity over the jacket surfaces, tends to reduce the end temperature of the charge especially when a quench area is used.

Intake temperature is generally a compromise for the natural induction engine; on the one hand to reduce final compression temperature it is desirable to hold intake temperature down; on the other, starting, warm-up and good gasoline vaporization need higher temperatures. In the case of supercharged engines it is possible to accomplish a considerable amount of cooling by the introduction of a cooler after the supercharger, without spoiling the vaporization. Where compression is

Help Maintain Production of 166 Pieces Per Hour — Lower Maintenance Costs

When you need high production with low unit and maintenance costs, consider the advantages of Roto-Matics. In this case the Roto-Matic is a station-type machine with indexing table. Drilling and reaming both suspension and king pin holes in front suspension support arms are performed at the rate of 83 pairs or 166 pieces per hour



General view of drilling and reaming machine equipped with new Roto-Matic mechanical power heads.

An outstanding new Davis and Thompson development incorporated in the design of this machine are the Roto-Matic mechanical, electrical power heads operated by screw feeds. Included among the safety features are overload release clutches on the feed screws. Six heads are used, three vertical and three horizontal. Lower maintenance costs are obtained through elimination of excessive servicing.

Machines similar to this can be designed to handle dissimilar operations in the same parts or one operation on continuous production. Investigate the profitable applications of Roto-Matics.

FREE DATA
will be furnished upon request. Write today. Ask for bulletin A-1

DAVIS and THOMPSON Roto-Matic

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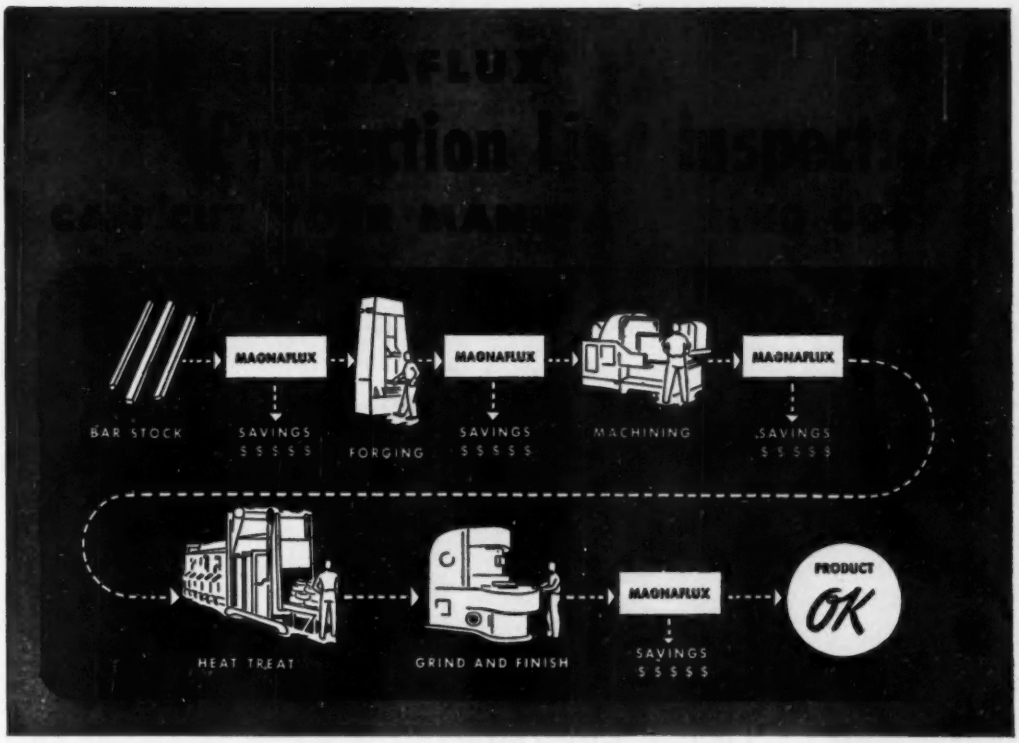

Defective parts are rejected *before* additional money is spent in finishing them with inspection by Magnaflux on the production line and trouble is found and corrected when it occurs—not later. For many plants this method of inspection is already saving thousands of dollars in manufacturing costs each year.

For example, by inspection with Magnaflux a gear manufacturer is able to reject defective pieces of material in bar form, or after forging. He saves the cost of machining, heat treating, grinding and finishing many pieces which would later be rejected at final inspection. In rejecting still more pieces after machining, with a third Magnaflux inspection, he saves the cost of heat treating and grinding.

Add up the total savings made by cutting out subsequent steps for all rejects. You'll see that *total* cost of inspection is *much less* than cost of carrying all defective parts to finish stage. Here is a table showing these savings:

Table Based on Processing 1000 Parts	Processing Cost Investment	Rejects Due to Operation	Savings in Cost to Finish	Inspection Costs all Parts
Bar	$ 1.00	10	$190.00	$ 70.00
Forging	3.00	10	170.00	69.30
Machined Gear	11.00	10	90.00	68.60
Ground and Finished Gear	20.00	20		67.20
		50	$450.00	$275.10

Inspection with Magnaflux not only pays for itself, but gives a net savings of $174.90 per 1,000 gears. This example is based on 100% inspection after each operation except heat treating. However, sampling methods often can be used for similar in-process inspection to cut manufacturing costs.

Magnaflux, and other Magnaflux Corporation non-destructive testing methods, make cracks and other defects readily visible for inspection of every part at production line speed. Write today for full information on how Magnaflux can help you raise product quality and cut production costs.

**Magnaflux, Reg. U. S. Pat. Off., a trade mark of Magnaflux Corporation applied to its equipment and materials for magnetic particle inspection.*

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two-stage, as in supercharging, this intermediate cooling can have a very pronounced effect on the octane demand of the engine. One example of which we have rather full knowledge is a racing engine of 13.5 to one compression ratio overall, operating on 82 ASTM, 83 Research octane without detonation. The drop in temperature provided gave the equivalent of eight to one compression ratio temperature, approximately. The rest of the reduction in octane demand was due to the high speed and especially well-cooled cylinder barrel and head. A very thin steel sleeve for the barrel and an aluminum head were used.

Much better jacketing and head cooling passages can be provided. There have been many designs on the market in which boiling was occurring in the jacket, usually near and around the exhaust valve connection. There has never been any excuse for boiling in the jackets because it is known that any liquid normally used for cooling, water and water-glycol mixtures, can take away far more heat per square inch of transfer surface than any gas can bring to the other side. Consequently, the boiling has always been the result of undirected flow and velocities much too low. In other heat transfer apparatus we do not consider velocities of much less than five fps and in many cases velocity is carried up over seven fps. No such condition has ever existed in the jacket of the ordinary engine designs. In many cases the velocities are so low as to result in viscous flow, consequently very uneven cooling and striation. The major reason jackets have not been better designed is due to cores being made sturdy enough to keep rejects in the foundry under control and failure to calculate the flow path conditions.

The hot exhaust valve effect can be largely cancelled out by the position from which the ignition is started. The remaining unfired charge will be away from the exhaust valve where it can be reasonably cooled, but obviously the effect of the exhaust valve in heating the total charge cannot be eliminated.

Ever since internal combustion engines have been produced, we have been generally using uncooled pistons and are still using them for most designs today. With piston temperatures likely to go up, in the heavy duty designs particularly, we should be giving serious consideration to liquid piston cooling. The advantages would be considerable; certainly lubrication could be improved and ring-belt temperature reduced. In addition, if quench areas are used for the last portion of the charge to fire, a cooled piston could assist this situation greatly; and an uncooled piston furnishes up to 50 per cent hot area in the so-called quench region.

So far as the effect of residual gases is concerned, higher compression ratio by itself tends to reduce this effect by reducing the quantity.

Manifolds have an influence on the picture because, due to striation, a manifold can produce leaner mixtures than average at one or more cylinders and these are usually the ones at which detonation will first occur. Manifold design, it would appear, is still not in a very good state. The cause of manifold pressure loss is not so much skin friction, but largely elbows. Elbows not only produce considerable drop but also encourage striation of gasoline into rich and lean mixtures.

We are interested to reduce total pressure drop, to keep up volumetric efficiency, and to reduce striation as far as possible, in the interests of wiping out the lean cylinders.

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Write for our new brochure SCIENCE IN THE FOUNDRY. It gives complete information on centrifugally cast cylinder liners and on all other CWC products such as: cast cylinder blocks and heads; cast pistons; cast camshafts; cast crankshafts; cast gears; centrifugally cast Centrifuse brake drums; and a large variety of steel castings.
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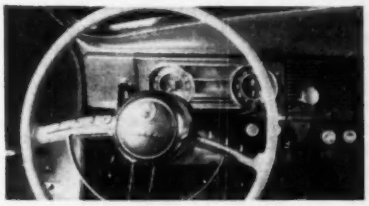

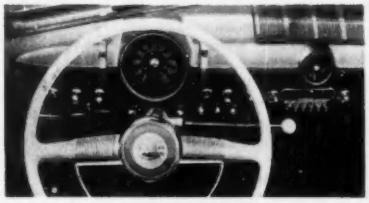

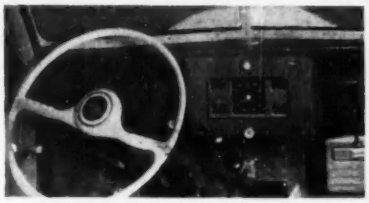

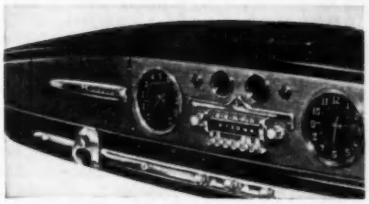

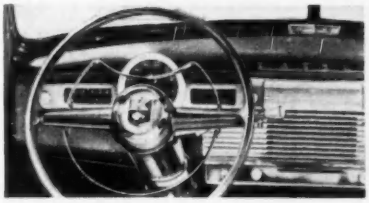

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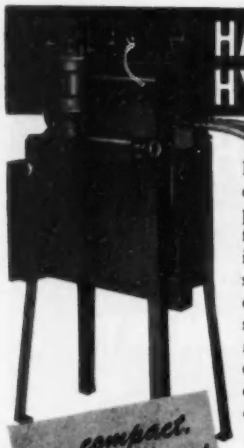

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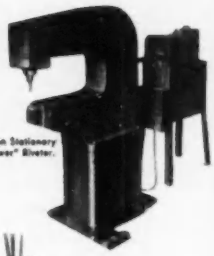
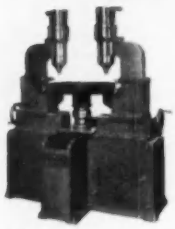

17½-ton Stationary "Hy-Power" Riveter.

Gooseneck Type Yoke Riveter.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"Hy-Power" Multiple Riveting Press.

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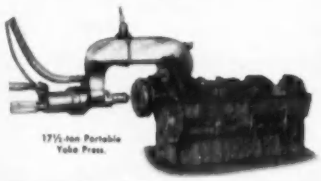
17½-ton Portable Yoke Press.

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AIR CYLINDERS • HYDRAULIC CYLINDERS • HYDRAULIC PRESSES
PNEUMATIC PRESSES • HYDRAULIC RIVETERS • AIR CONTROL VALVES

Ultramatic Improvements

(*Continued from page* 102)

and timing valve have eliminated all step bores and some blind holes, producing a general improvement in valve bores. A new converter relief valve restricts converter flow in reverse, thereby increasing pump pressure for greater capacity of the reverse band. Converter pressure in direct drive has been increased from 12 to 20 psi to assist in improving direct clutch release. A stop has been added to the throttle valve to eliminate loss of pressure when unusually quick operation is required.

The throttle valve shaft is grooved to provide some damping to the valve to reduce occasional flutter. An accumulator in the form of an enclosed hollow ball has been added to dampen valve action and thus reduce occasional noise.

Control linkage from the engine to the Ultramatic drive throttle valve has been redesigned, simplifying it by eliminating two links and a bell crank. A new method of adjustment of the throttle valve assures more accurate geometry of the linkage, resulting in better control of throttle, modulated pressures, and shift pattern.

AIRBRIEFS

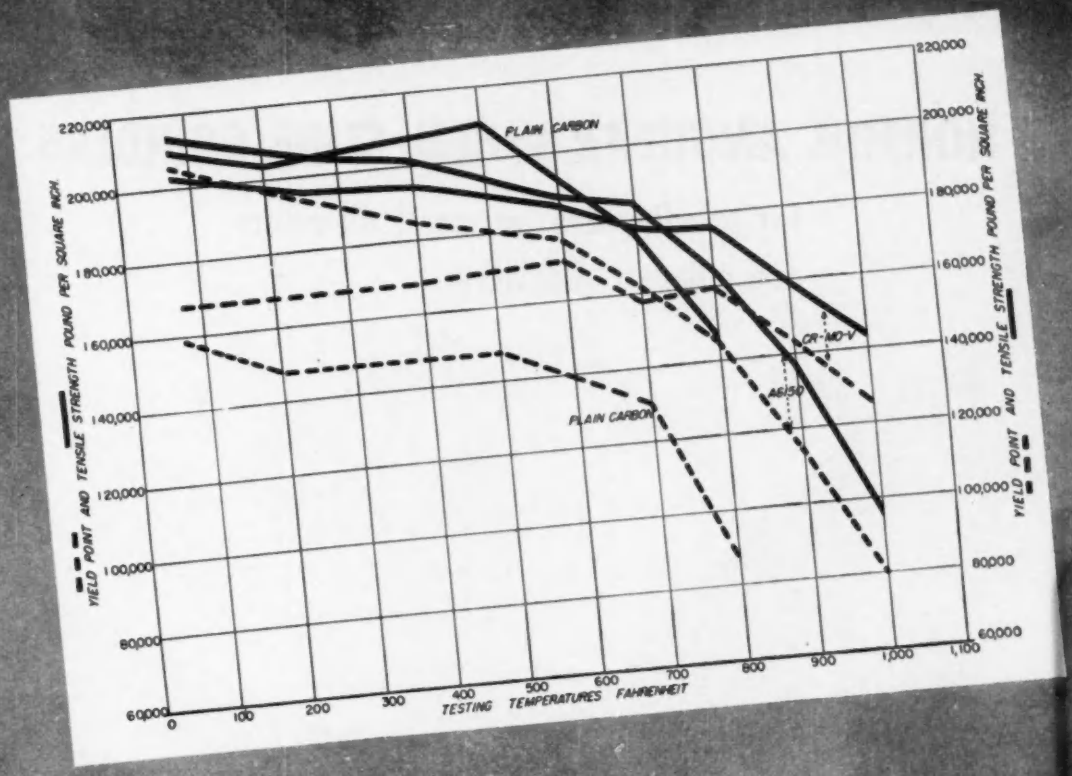
(*Continued from page* 48)

to handle the airlift problem and 100 four-engine transports were immediately available for the job, ranging from the familiar C-54 to the Boeing C-97 and the huge Douglas C-74. In addition, a request for four-engined aircraft and crews went out to the commercial airlines and virtually all of the domestic lines have furnished equipment with a total of 65 commercial transports detailed to MATS. Initial difficulty, however, was the fact that MAT'S own 100 airplanes had only about one crew each, whereas the airlines furnished about three crews for each airplane, thereby increasing greatly their total airlift availability. As this was being written, this airlift had passed the hump in requirements and not only were five additional transports being refused but it appears that some of the 65 commercial airplanes are now scheduled for return to their owners. It is of interest to note that 15 of these transports were drawn from nonscheduled airlines, which another branch of the U. S. government, the Civil Aeronautics Board, has done about everything possible to put out of business.

War is Different

A recent action by the Navy typifies the kind of thinking that makes war so

(*Turn to page* 116, *please*)



HIGH TEMPERATURE PROPERTIES

of Cr-V and Cr-Mo-V Spring Steels

SPRINGS FOR SERVICE at elevated temperatures require steels which resist softening and lowering of the yield point. Unless hardness and yield strength are stabilized by correct alloy additions to the steel, these properties deteriorate rapidly as the temperature is raised.

The chart above shows the yield point and tensile strength of three types of spring steel at elevated temperatures determined by standard short-time tension tests.

Springs of plain carbon steel are sometimes used at moderately elevated temperatures, although their lower yield values prevent them from giving service as satisfactory as that of the alloy spring steels.

Chromium-vanadium steel springs, such as AISI 6150, give better service at ordinary temperatures because of the higher yield point. In addition, they may be used at operating temperatures up to about 700° or 750° F because they retain high yield point values as the temperature is increased.

Chromium-molybdenum-vanadium steel was especially designed for springs operating at temperatures in excess of 750° F. It can be used for springs operating at temperatures as high as 850° F or even higher under some conditions. At 800° F, the yield point of this steel is still greater than that of plain carbon steel at room temperature.

If you have a problem in spring applications at elevated temperatures, our metallurgical engineers will be glad to help you solve it.

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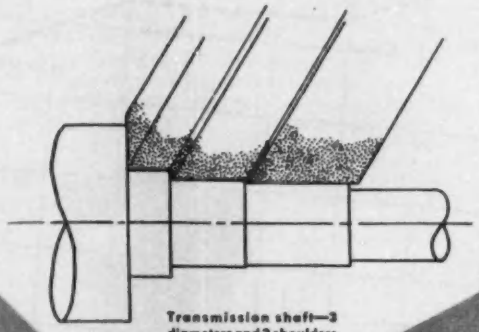
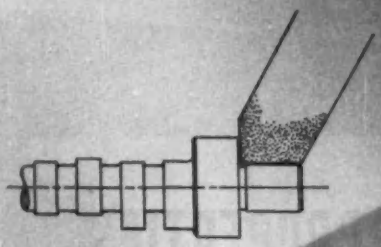
NORTON *ANGULAR* WHEEL SLIDE GRINDERS

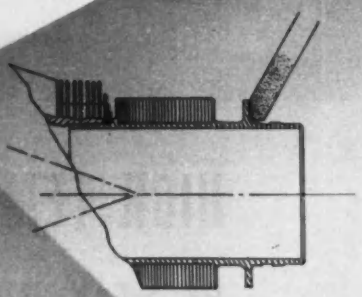
For grinding one (or more) diameters and adjacent shoulders



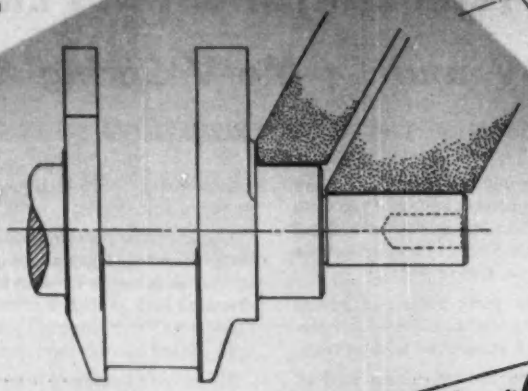
Transmission shaft—3 diameters and 3 shoulders



Camshaft—gear fit and thrust shoulder



Aircraft engine cylinder —flange seat and fit diameter



Crankshaft—end main bearing and shoulder and gear fit diameter

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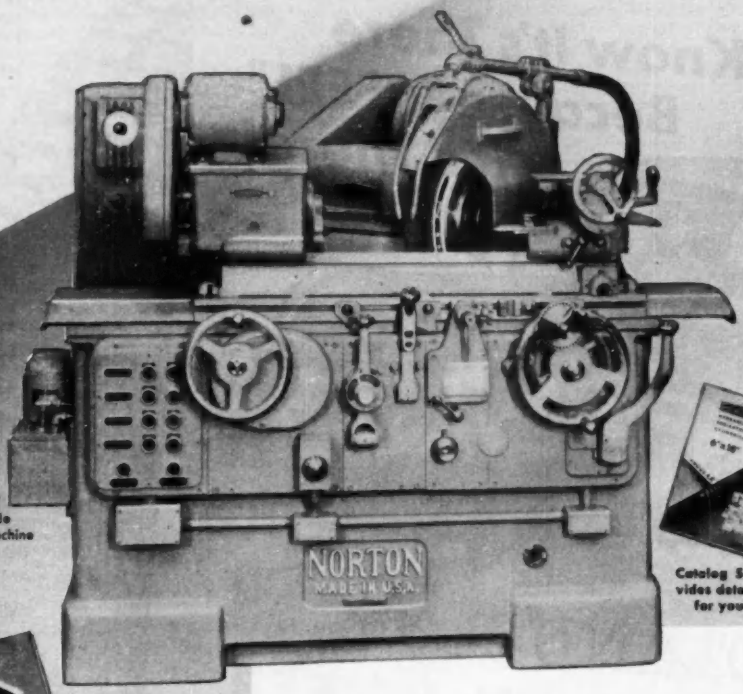
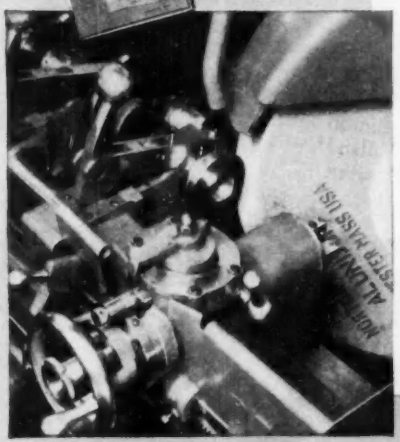


NORTON 6 x 18" Angular Wheelslide Semiautomatic Machine

Catalog 533-1 provides details. Write for your copy.

Catalog 1793-1 provides details. Write for your copy.



Norton 10 x 36" Angular Wheelslide Semiautomatic Machine grinding crankshaft flange face and two diameters

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Air and Vacuum POWER BRAKES

World's Largest Manufacturer of AUTOMOBILE and TRUCK FRAMES

Air and Electro-Pneumatic DOOR CONTROLS

Popularity of Scooters in Italy

(*Continued from page 47*)

7000 scooters per month is absorbed by the domestic market.

In Italy the scooter is regarded as an intermediary between the pedal bicycle and the motor car. What makes it attractive to the public is its low price, which is made possible by employing modern methods of production, similar to those in use in the automobile industry. Scooters are assembled on conveyors from parts that have been machined on automatic tools and subjected to the most rigid inspection.

A survey made on the basis of 45,000 scooters sold showed that 32 per cent are being operated by workmen and other employees, 22 per cent by traveling salesmen and small merchants, 16 per cent by physicians, eight per cent by members of the liberal professions, seven per cent by farmers, seven per cent by tradesmen, and the remainder by school teachers, students, and others. Italian production of scooters increased from 2500 in 1946, to 11,000 in 1947, to 32,000 in 1948 and to 71,000 in 1949; and the production is expected to reach 130,000 during the current year.

According to Dr. Lauro, the low cost of the motor scooter will ensure its future. This applies particularly in Italy, because Italians are fond of the motorcycle, the standard of living in Italy is low, climatic conditions are favorable to the use of the machine, and even a low-priced business automobile is more expensive. The manufacturers hope to bring the price of the scooters down to 100,000 lira ($160). Considerable interest in the Italian scooters has been shown in other European countries. Two important German firms have secured manufacturing rights for the Vespa and Lambretta, and a monthly output of 3000 machines is contemplated. The Douglas motorcycle firm in England has secured a license for the manufacture of the Vespa, and in Holland the Kaiser-Frazer organization is said to be negotiating for a Lambretta license. Switzerland imported about 1000 Italian motor scooters in 1948 and 3000 in 1949.

The Vespa has a pressed-steel, shell-type frame, which is its principal outward characteristic. It has a two-stroke engine of 7.63 cu in. displacement, with cross-flow scavenging directed by a deflector on the piston head. The engine is fan-cooled and transmits its power to the rear wheel by means of spur gears, without the use of chains or intermediary shafts. The engine housing on one side of the rear wheel is balanced by a similarly shaped tool and baggage compartment on the opposite side, thereby producing a rather esthetic effect. According to the manufacturer's literature, the machine weighs 165 lb, has a maximum speed of 43.5 mph, and a mileage of 117.5 per U.S. gallon of fuel and oil mixture. Ignition is by a flywheel magneto and the maximum engine output is 4.3 hp.

The Lambretta has a frame of predominantly tubular construction, and according to Dr. Lauro was designed with a view to the rational mechanical arrangement of parts, rather than for esthetic effect. Its engine also is of the two-stroke type, but is scavenged by double flow, the piston head being slightly cupped. The bore is 2.16, stroke 2.36 in. and displacement 7.63 cu in. With a compression ratio of 7 to 1 the engine develops 4.3 hp at 4000 rpm. Cooling is by natural circulation over the finned cylinder.

While the main frame members are tubular, the engine crankcase and the

WHATEVER YOU FASTEN . . .
COMPOSITION TO COMPOSITION
FABRIC TO FABRIC
WOOD TO WOOD
METAL TO METAL
OR ANY COMBINATION OF THESE MATERIALS . . .
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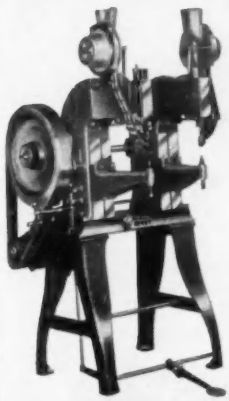
Chicago AUTOMATIC RIVETING
FASTENS IT RIGHT . . . AND FASTENS IT FAST



In Chicago Automatic Rivet Setters from 1 to 4 tubular or split rivets are fed, inserted and clinched in a fraction of a second with each operating pedal release. Adjustment on some models permits handling different sizes of rivets. Riveting machine also adaptable for eyelets, grommets or drive screws.

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baggage carrier together with a part of the tubular structure form a truss which takes the entire reaction of the rear wheel. There are tandem seats on top of the tubular frame. Current for ignition and lighting is produced by a six-pole flywheel magneto which generates between 24 and 30 watts at 6 volts. There is a 90-deg gear drive between the crankshaft and the shaft which carries the pinion of the final-drive bevel-gear set. The torque is transmitted by a torsion bar or quill of only 0.322 in. diameter, which deflects as much as 16 deg under full engine load in low gear, thereby protecting the transmission against severe shock.

The rear-wheel rim is split centrally. Three equally spaced bolts hold the halves together, and three additional bolt holes in the rim serve to fasten it to the hub. Demounting is accomplished in the same way as with automobile wheels, the wheel being carried on an overhanging spindle. The three-speed transmission is controlled by means of the left-hand grip of the handle bar, through the intermediary of a push-and-pull type flexible control mechanism. The Lambretta is produced also in a commercial form, as a tri-carrier.

In order to hold down the production costs the most modern production methods are employed. Metal powders are used for certain parts, including the piston rings, for which they are said to be particularly adapted because the sintered, porous structure holds the oil and ensures excellent lubrication. Some parts are heated by high-frequency induction currents for hardening, tempering, and brazing. Many parts are assembled by brazing.

BOOKS . . .

ASTM STANDARDS ON COPPER AND COPPER ALLOYS, published by *American Society for Testing Materials*, 1916 Race Street, Philadelphia 3, Pa., Price $4.35. The 105 ASTM Standards pertaining to copper and copper-base alloy are brought together in a convenient up-to-date form. There are 20 specifications on copper, copper alloy, and copper-covered steel wire, rods, bars, and stranded conductors for electrical purposes. Another 13 specifications cover various non-ferrous metals, and there are 61 specifications on various copper and copper alloy products. Nine test methods and two recommended practices also are included.

RECOMMENDED PRACTICES FOR RESISTANCE WELDING, published by *American Welding Society*, 33 West 39 Street, New York 18, N. Y. Price $1.00. This new edition represents a modification and expansion of the Standard originally issued in tentative form in 1946. Included are welding schedules for spot and seam welding mild and medium carbon steels, low-alloy steels, stainless steels, nickel, Monel, Inconel, and magnesium alloys. Recommended practices for projection welding cover low-carbon and stainless steels. Flash Welding data is provided for low and medium forging strength steels.

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AIRBRIEFS

(*Continued from page* 108)

costly. You will recall the action of the Navy about a year ago in wrapping the two giant Lockheed XR60-1 Constitution transports in mothballs because they were too costly to operate. Now the Navy has unwrapped these two huge planes and placed them back in operation with the Fleet Logistics Wing. We have no quarrel whatever with the economy, or lack of it, of the sleek transports, which feature an unusually efficient design and which were designed to operate more economically than any other airplane of comparable size, according to their builder. But what we do quarrel with is simply the fact that they were too uneconomical for the Navy to operate a year ago but today they are not. In other words, if two Douglas R5D transports are assumed more economical to operate than one Lockheed R60 in transporting the same load over the same distance, we can't see why this fact doesn't hold either in war or in peace. It is obvious that there is not only the same but a much greater necessity for economy in war than there is in peace but the word "emergency" has always meant a blank checkbook in the services, and this fact possibly accounts for a substantial part of a war's cost.

Turboprop Day Dawns

The first scheduled airline service using turboprop power has begun with inauguration of London-Paris service by British European Airways using the Vickers-Armstrong Viscount. Powered by four Rolls-Royce Dart turboprop engines, the airliner carries 40 people over the route in less than one hour, compared to the 1½-hr schedule of regular airliners. BEA is introducing the airplane in a subtle but clever way; passengers do not know in advance they will ride a turboprop airplane. Thus, passengers may go one way or the other in the standard Vickers Viking twin-engine transport, affording a striking contrast in comfort, speed and pleasure. BEA doesn't miss the opportunity to inform the passenger that he is riding in the "newest and finest standard of airliner accommodations," etc., nor that more and more Viscounts will be in service shortly. Meanwhile, America's first turboprop airliner—privately owned—has yet to make its first flight.

Subsidy Required

The somewhat camouflaged but nevertheless substantial subsidy paid United States airlines by the Government, target for vociferous criticism by the railroads and anti-administration economists, is hardly unique in the world. The Brazilian government recently proposed to reduce its airline subsidy from 75 million to 35 million cruzeiros and ran into stubborn resistence in its Parliament amidst claims that its airlines could not carry on without their full annual subsidy. The Argentine Government voted a sum of 13 million pesos for support of its airlines for only two months and expects the total to exceed 100 million pesos for the year. Sweden's A.B. Aerotransport applied to the Swedish Riksdag for a total of 500,000 kroners to make up a deficit for the year. The Dutch government has not only awarded Fl. 27,500,000 to KLM for the year but an interest-free loan of Fl. 10 million and Fl. 65 million in new capitalization. Switzerland is planning to purchase new equipment and then lease it to Swissair. And so it goes around the world, with the U. S. one of the least offenders.

Many a Slip

The textbooks say that the Lockheed F-80C jet fighter can get off the ground in just 2980 ft but pilots in Korea are asking for a minimum of 6000 ft in their airstrips. They have found they can get off the ground with four rockets under their wings—provided the takeoff is made in the early morning hours. Later in the day, when the

"Quality Control" is the means by which TUNG-SOL Auto Lamps are rigidly held to highest standards. It is the reason why the enormous volume of TUNG-SOL Lamps required by automobile manufacturers and the replacement trade is so uniform and dependable year after year.

Quality Control is an independent inspection unit operating within the TUNG-SOL organization. It examines and tests continuously all along the line of manufacture. It has the authority to reject one lamp, or a day's production should they fail to measure up to specifications.

This rigid self-discipline is to our customers' benefit, therefore to our advantage. It serves to make the trademark TUNG-SOL a symbol of quality in miniature lamps and all glass sealed beam headlights.

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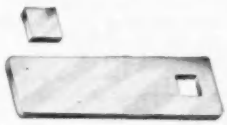

The Mallory designed and built die, pictured at top, welds an electrical contact to a reed in eight stations at a rate of 1000 units per hour. Each station is an independent unit that is easily replaced for dressing or repair. Each station has its own water cooling system and device for automatic ejection of welded parts.

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Mallory can supply complete Resistance Welding needs. Merely send prints, sample parts, production requirements, available machine data, platen dimensions. What Mallory has done for others can be done for you.

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sun has softened up the asphalt, only two rockets can be carried with an otherwise full military load. The runways get so soft that the F-80C can be landed and rolled to a stop without use of brakes during the middle of the day, whereas at other times hard braking is required to get the craft slowed down after its 100 mph landing. Air Force long ago learned to calibrate jet fuel tank capacities in pounds instead of gallons and experience in Korea has proved the wisdom of this idea. The F-80C can accommodate up to 5000 lb of jet fuel but the temperature variations during the day make this weight vary anywhere between 600 and 700 gal. And the thrust of the jet engines on otherwise identical aircraft varies as high as 15 per cent one from the other. These are only a few of the countless reasons why operations people thoroughly mistrust the slide rule boys, but the latter merely point out that all their figures were carefully qualified by the useful phrase "under standard conditions," which seemingly are never met in actual practice.

Electric Window Lift

(*Continued from page* 42)

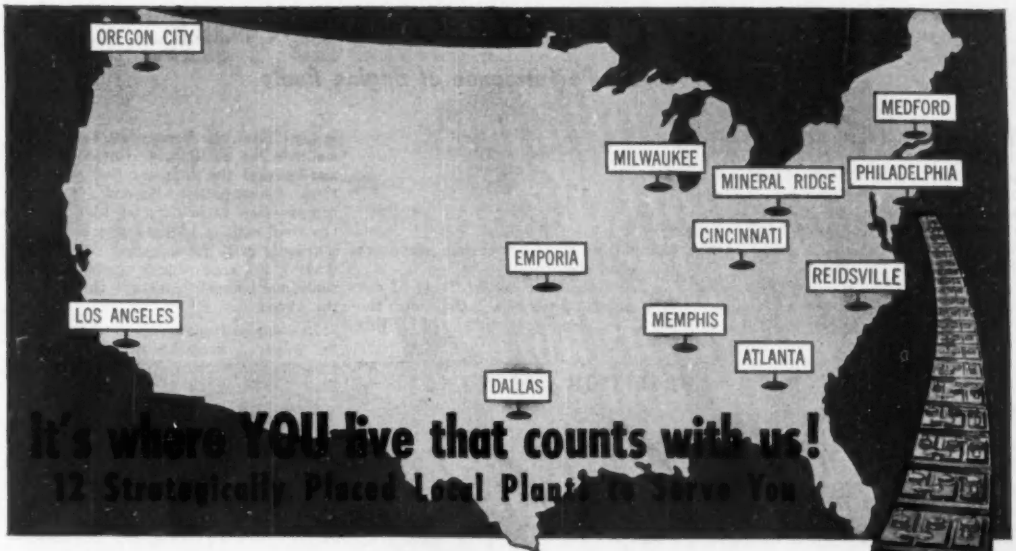
very quickly to any desired position by moving the button up or down. When finger pressure is released, a spring returns the button to the neutral position, thus breaking the electrical circuit.

Movement of the operating button energizes the relay which controls the flow of current to the motor through the circuit breaker. The motor, in turn, drives the screw shaft and thus the bell crank until the button is released. The electric power used to raise a window from the full open position to the closed position is said to be negligible.

BOOKS . . .

STRENGTH OF WROUGHT STEELS AT ELEVATED TEMPERATURES. This 1950 Report giving a wealth of information and data on the chemical and physical properties of wrought steels at elevated temperatures, prepared by Messrs. *R. F. Miller* and *J. J. Heger*, of the Carnegie-Illinois Steel Corp., was issued under the auspicies of the *A.S.T.M.-A.S.M.E. Joint Committee on Effect of Temperature on the Properties of Metals*, by the *American Society for Testing Materials*.

Data for the Report most of which are in the form of graphs, were gathered from a wide variety of sources. The Report is in two sections, the first covering the plain carbon and alloy steels containing molybdenum and up to 3 per cent chromium; the second part covers the ferritic and austenitic steels with more than 5 per cent chromium. The latter includes many of the stainless varieties. There are 112 pages, 8½ by 11 in., and the book is bound in heavy paper cover. Copies can be procured from *American Society for Testing Materials*, 1916 Race Street, Philadelphia 3, Pa., or from A.S.M.E. Headquarters, at $3.00 each.



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EFFECT OF HYDROCARBON STRUCTURE

on Anti-Knock Performance of Engine Fuels

By T. B. Prickett
M. H. Campbell
R. L. Johnson
and D. A. Knee

E. I. du Pont de Nemours and Co., Inc.

IN view of the current major engine design trend toward increased compression ratio and the present emphasis on higher octane gasolines, it is desirable to re-examine the fuel chemical characteristics involved in obtaining maximum road antiknock performance and lead response. The particular objective of this is to show how road ratings can be improved or modified relative to laboratory knock ratings by changes in the hydrocarbon structure of a gasoline.

There were two major effects of car type on road antiknock ratings with the 14 basically different fuels used for this study. First, the four types of standard compression ratio cars responded very similarly to the different fuel compositions investigated. Second, in high compression ratio cars at high speed, the road ratings of the fuels increased markedly with compression ratio, thus making the road octane numbers of all fuels more nearly constant throughout the speed range.

In standard compression ratio cars, for a given research octane number, paraffinic insertions in either light or heavy ends of the fuels gave better overall road octane performance than other inserts. The addition of 1.0 cc tetraethyl lead per gal to the test fuels, Fig. 1, raised road octane numbers slightly less than laboratory octane numbers. Increasing tetraethyl lead concentration from the 1.0 to the 3.0 cc per gal level increased road octane numbers somewhat more than laboratory octane numbers. In high compression ratio cars, front-end olefinic insertions gave higher octane numbers on the road relative to the laboratory than did paraffins. There was little effect of heavy-end chemical type changes on road performance at 10 to one compression ratio.

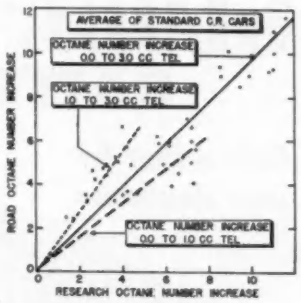

Fig. 1—Effect of tetraethyl lead level on the increase in 1200 rpm modified Borderline road octane number in standard compression ratio cars compared with the increase in research octane number.

The significance of these conclusions is that in the selection of the chemical make-up of gasolines to give best road antiknock performance for a given level of laboratory research antiknock quality: (1) In present day cars, the use of a substantial amount of paraffins is desirable. (2) Based on one type of engine only, for compression ratios substantially above those in current use, olefinic fuels may be expected to exhibit slightly better road response than those which are predominately paraffinic in composition.

The foregoing article is an extract of a paper presented at the Motor Fuels

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Precision has been our business for 48 years—we consider this backlog of experience in designing, engineering and manufacturing one of our invaluable assets, so essential to any organization doing this kind of work. Invaluable, too, are the many veteran and skilled IGW craftsmen who have grown up in the business and to whom precision workmanship is second nature.

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Sudden surges of oil pressure caused by stop-and-go driving will increase the tendency of old-style oil filters to pack down . . . leave a "channel" for dirty oil to pass through with its engine-wrecking dirt and abrasives.

But there are no "loopholes" in a Purolator Micronic* Oil Filter. It is a scientifically designed barrier through which the oil must pass. It cannot be affected by sudden changes in oil pressure . . . or by temperature changes or water dilution.

And why? Because Purolator Micronic* is made of cellulose specially impregnated with plastic . . . engineered into an accordion-pleated form that provides a filtering surface 5 times that of old-style filters. This element filters engine-wrecking particles measured in microns (.000039 of an inch) . . . and does it faster.

Car owners everywhere are reading about Purolator via the most aggressive coast-to-coast advertising campaign in the oil filter industry. That's why you'll get greater acceptance for vehicles and engines carrying Purolator Oil Filters as original equipment.

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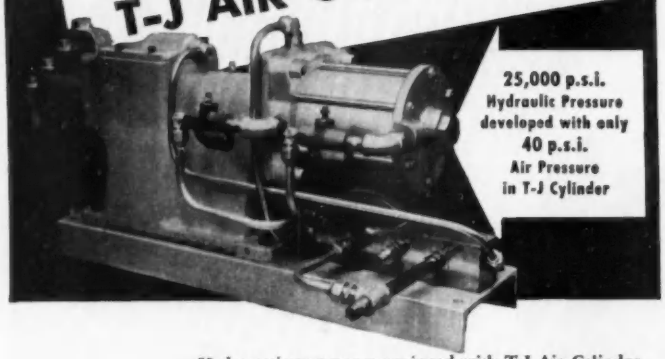

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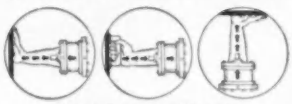

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T-J

33 YEARS EXPERIENCE

session of the 15th Midyear Meeting of the Division of Refining, American Petroleum Institute, in Cleveland. Ohio.

Suppliers Needed

(*Continued from page 37*)

the armored personnel carrier. When the new unit is completed, Melrose Park Works will require a net addition of at least 1500 new employes. All down the line it is going to take considerable time to complete facilities and tooling so that anything like volume output of military goods is still several months away at the earliest. Only exception, of course, is the tank production program at the Detroit Arsenal which has been under way for a considerable period.

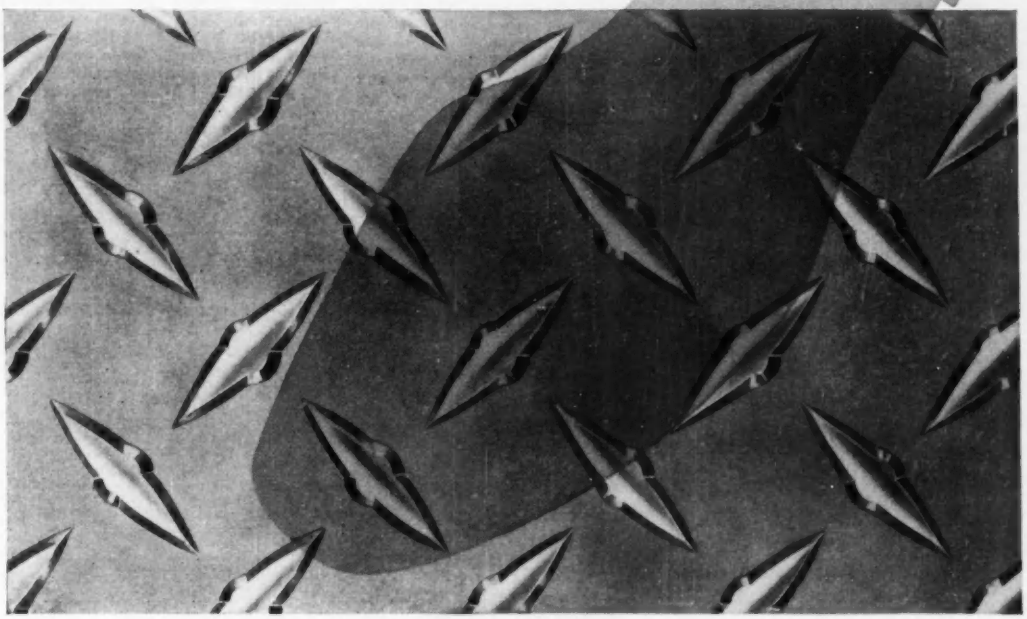
Details of the combat vehicles that are to be built under the five contracts are necessarily classified as restricted information and will remain so until the weapons are in combat service and known to the enemy. However, it is known that all will be powered by the aircooled engine developed by Ordnance and Continental Motors, which will be the principal supplier, for the present at least. The number of power plant and spare parts suppliers will be considerably less than was required previously because, as a result of standardization, only one basic engine is to be used. Variations of the basic engine will be made, such as supercharging, to adapt it to the particular power requirements of the vehicle in which it is used, but interchangeability of parts will be standard throughout the line. The engine is designed also so that additional cylinders can be added. With this setup, the number of spare parts required for servicing is about 950, compared with 5165 separate items needed for maintaining medium tanks alone in which six different engines were used in World War II. Another important advantage of standardization is that only one set of tools and maintenance instructions is required and mechanics will be trained more quickly to handle engine repairs on any combat vehicle.

Since the end of World War II, there has been much talk but little understanding of the terms Phase I, Phase II and Phase III. Here is a brief outline of what they indicate:

PHASE I—A planning study of the problems involved in building certain specified items. The amount to be spent on each study was limited by Congressional action to $12,000. Such studies have been completed by the following companies: Cadillac, light tanks; Allison Div. of G.M., cross-drive transmissions; Continental Motors, aircooled engines; Continental Foundry & Machine Co., cast armor; Carnegie-Illinois Steel Corp., roller armor, and Chrysler Corporation, medium tanks. It is understood that Chrysler may be asked to

(*Turn to page 126, please*)

LIGHTER TREAD FOR A TIGHTER TOE HOLD



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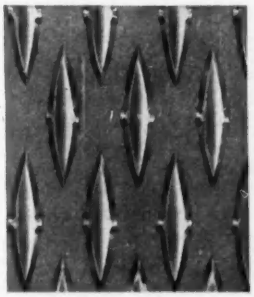
2. ***It adds safety.*** New Alcoa 2-way tread pattern gives a firm foothold, helps prevent accidents.

3. ***It saves maintenance.*** Because it is aluminum, Alcoa Tread Plate resists corrosion, needs no paint, is cleaned easily.

ALUMINUM COMPANY OF AMERICA, 1841J Gulf Building, Pittsburgh 19, Pennsylvania.



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Big Broaching Machine Boosts Cylinder Head Output

(*Continued from page 33*)

which fit in the combustion chamber side of the head and must line up accurately before the machine is permitted to cycle.

At the completion of the first operation, the fixture moves outwardly from the broach, the work is pushed into the center fixture, and the next rough head is moved into the fixture. Meanwhile the broached head enters the station in the center where it is rolled over 180 deg so as to present the bottom face to the broach while mounted in the second station fixture. At the second station the head is accurately located against the two broached faces and locked in position. Movement of the ram then finishes the bottom face—which contains the combustion chambers—as well as the manifold port side.

Getting down to the details of the tools, consider that each carbide-tipped bit is provided with a jack screw and locking nut as illustrated. This arrangement makes it possible to remove an individual bit for sharpening, then to adjust the jack screw to the proper overall length. Upon replacement in the broach holder, all bits are of exactly the right length without further adjustment.

The tooth height progression which determines the depth of cut, or chip thickness, for each successive row of bits is established by spacer bars located beneath each row of bits in the tool holder. A new tooth height progression can easily be established by changing the thickness of the spacers, but of course, this is never necessary after the correct cutting conditions for each particular job have been established.

The arrangement of cutting tools on the ram, in detail, is as follows:

First Operation—Top of head and cover face, four tool holders

1—First Rougher
- (a) Eleven solid Tantung bumper blades for cover face. Blades are $\frac{5}{8}$ in. by $1\frac{1}{4}$ in. by 4 29/32 in. Tooth height progression established by taper mounting face (taper 5/32 ipf).
- (b) Fifty-four carbide tipped bits, for top surface of head. Carbide inserts $\frac{1}{4}$ in. by $\frac{3}{8}$ in. by 1 in. Bits one in. square. Twelve rows of bits alternating five and four bits per row. Tooth height progression, or depth of cut 0.006 in. per row.

2—Second Rougher
- (a) Ninety-nine carbide tipped bits for cover face. Carbide inserts 5/32 in. by $\frac{5}{8}$ in. by $\frac{5}{8}$ in. Twenty-two rows of bits alternating five and four per row. Tooth height progression established by tapered mounting face (taper 0.050 ipf).
- (b) Fifty-four carbide tipped bits for top surface of head. Same as first rougher except tooth progression is 0.005 in. per row.

3—Third Rougher. Same as second rougher except for tooth height progression.
- (a) 0.030 in. taper per ft mounting surface for cover face bits.
- (b) 0.004 in. to 0.0035 in. tooth progression on top surface of head.

4—Finisher
- (a) Fifteen solid carbide finishing blades $\frac{1}{4}$ in. by $\frac{5}{8}$ in. by 4 19/32 in. for the cover face. Tooth height progression 0.002 in. to 0.001 in.
- (b) Fifteen solid carbide finishing blades $\frac{1}{4}$ in. by $\frac{3}{4}$ in. by 7 9/16 in. for top surface of head. Tooth height progression 0.002 in. to 0.001 in.

Second Operation—Bottom surface of head and manifold face. Four sets of tools are also used in this operation. Tool holders, tooth height progression, etc., is the same as for the first operation with the exception that the manifold face is narrower than the cover face and uses shorter bumper teeth and finishing teeth, and fewer carbide tipped bits.

1—Twelve bumper teeth, 2 13/16 in. long are employed.

2—Second and third roughers use 66 bits apiece.

3—Finishing teeth are $2\frac{3}{4}$ in. long.

All tools for the bottom surface are the same as for the top surface.

The solid section Carboloy tools used for finishing are made up of blocks containing three tooth sections, each block numbered as to its position on the ram. This makes possible easy replacement and dressing of individual sections.

Tractors are made for tough duty. Day in, day out . . . on wheels or tracks, they help meet the needs of agriculture and industry in a thousand and one different ways. Service like this calls for radiators with real structural strength as well as efficient cooling characteristics. That's why leading tractor manufacturers rely more and more on Yates-American.

Yates-American makes both stamped and cast-type tractor radiators . . . uses heavy gauge materials to insure trouble-free long life.

Yes, Yates-American radiators have what it takes to handle the really tough cooling assignments . . . in trucks, locomotives, compressors and power plants, as well as tractors. Yates' engineers insure top results by teaming up in close cooperation with the manufacturer . . . meeting his specifications and helping him give his customers lasting satisfaction.

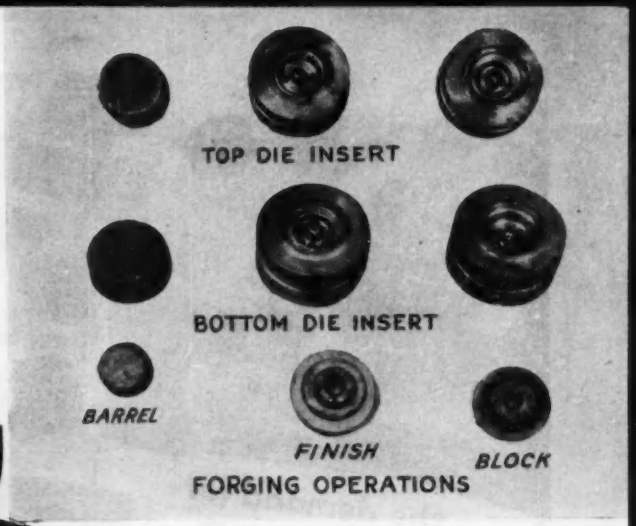
We'll be glad to tell you more about the advantages of Yates-American heat transfer equipment and how it can help you. Write now for complete information and descriptive literature.

California Representative: E. E. Richter & Son, Emeryville, California

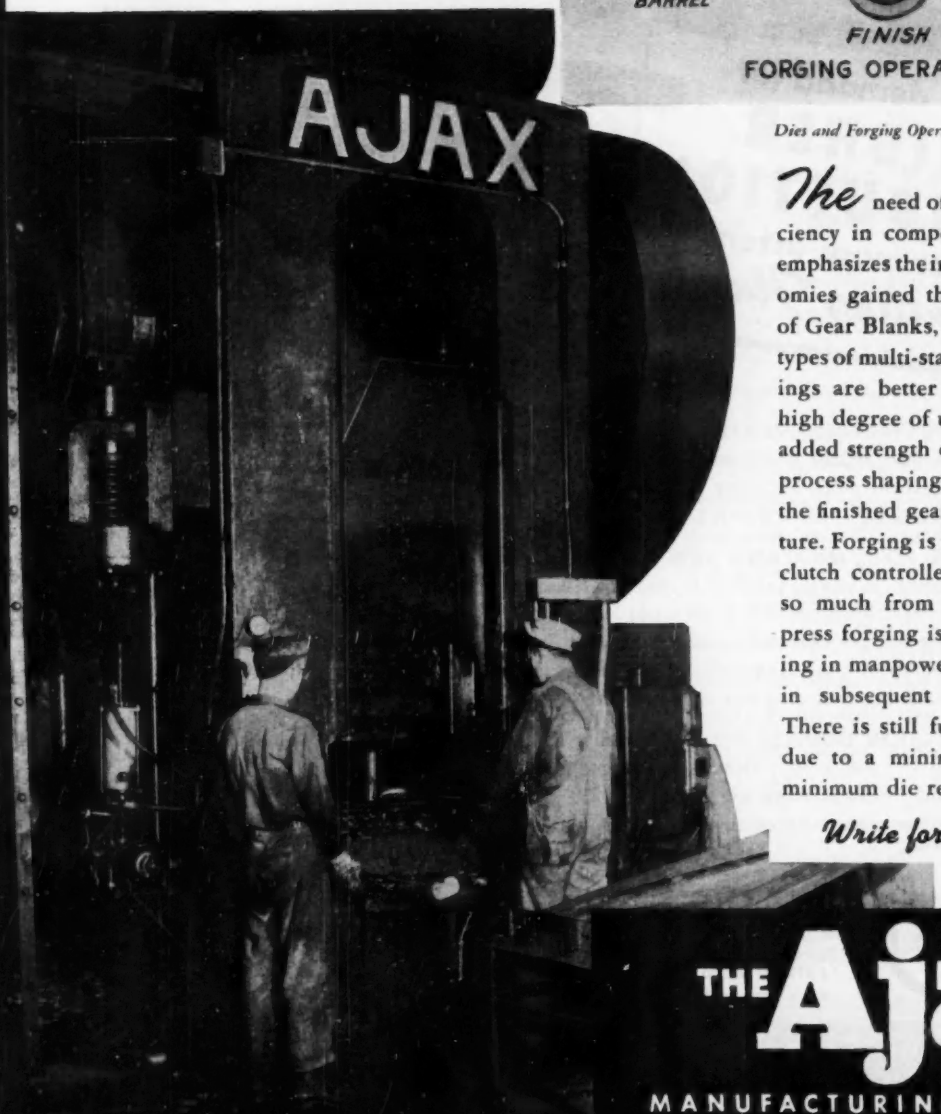
YATES-AMERICAN MACHINE CO.
HEAT TRANSFER PRODUCTS DIVISION BELOIT, WISCONSIN

PRESS FORGE GEAR BLANKS

better! faster! cheaper!



Dies and Forging Operation for Tractor Gear Blank



Forging Tractor Part on AJAX FORGING PRESS at International Harvester Company, Louisville, Kentucky, Works.

The need of high production efficiency in competitive industry today emphasizes the importance of the economies gained through Press Forging of Gear Blanks, as well as many other types of multi-stage forgings. The forgings are better because they have a high degree of uniformity of size and added strength due to the hot forging process shaping the grain flow so that the finished gear has a stronger structure. Forging is faster, as the quick air clutch controlled press ram achieves so much from a single stroke. And press forging is cheaper through saving in manpower both in forging and in subsequent finishing operations. There is still further saving in metal due to a minimum of flash and in minimum die replacement cost.

Write for Bulletin 75-B

THE **Ajax**
MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
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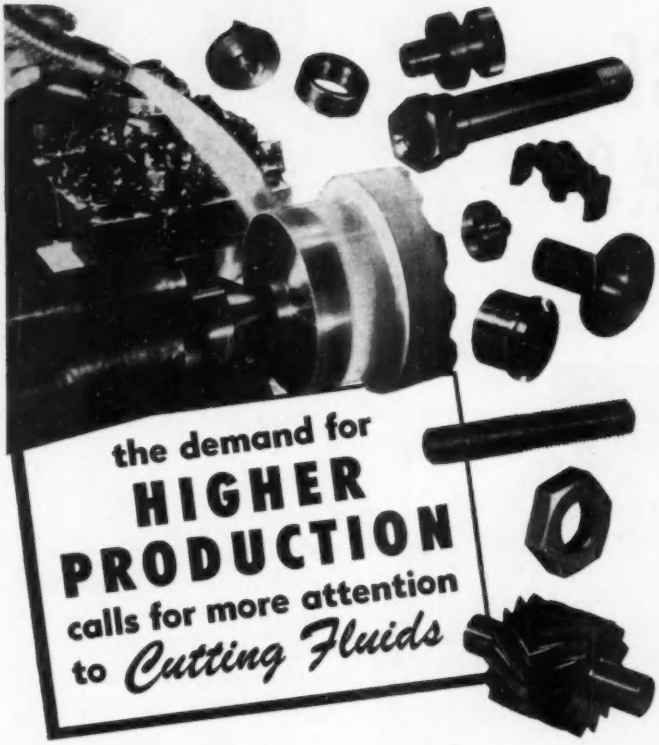


★ ***PRODUCTION INCREASED FROM 18 to 31 PIECES PER HOUR*** machining pipe union from 18-8 stainless steel in single spindle automatic *after* changing over to Stuart's THREDKUT 99.

★ ***SPEEDS, FEEDS INCREASED 50%*** turning, drilling, facing, reaming, tapping forged steel valve bodies (equivalent SAE 1315) on turret lathe after applying Stuart's SOLVOL water soluble cutting fluid concentrate. And, excessive scrap loss due to high finish requirements was eliminated.

★ ***PRODUCTION DOUBLED*** boring 7½" dia. hole through 11" dia. x 30½" long solid forged 5060 steel pump liner through use of Stuart's SPEEDKUT B the multi-purpose cutting fluid.

Our 85th Anniversary Year

• **These are not isolated examples of how Stuart products and Stuart experience can help boost production. They are taken from daily field reports. Ask to have a Stuart Representative call. Send for your copy of "CUTTING FLUID FACTS," an interesting educational booklet.**

D.A. Stuart Oil Co.

2733 So. Troy St., Chicago 23, Illinois

Suppliers Needed

(*Continued from page* 122)

build tanks somewhere outside the Detroit area.

PHASE II—The actual organizational job after the contract is awarded. The prime contractor starts assembling his supervisory and labor force, orders tooling, lines up subcontractors, makes any required engineering changes in light of further testing of the item he is to build, and in general makes ready for production.

PHASE III—Actual start of production on a limited basis. This amounts to "educational orders" in which only partial production is started ahead of full scale effort in order to train employes and smooth out production kinks while tooling and other arrangements for full schedule operations are being completed.

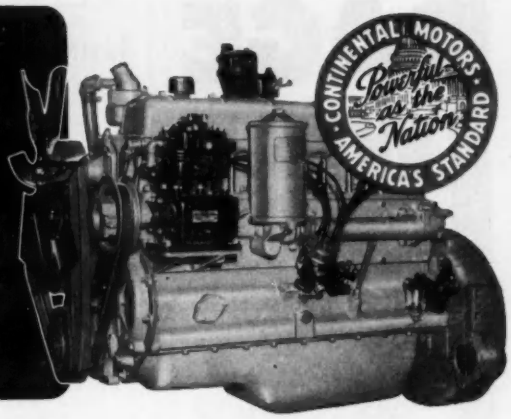
To determine the best possible prime contractors, the 14 Ordnance districts surveyed the industrial field last fall, analyzing about 100 companies. Of this group, 34 were recommended and 16 finally selected. Several factors were considered, including size, aggressiveness, plant capacity, ability to expand if necessary, subsidiary supplier facilities, and financial status.

It is obvious to anyone who witnessed the confusion, duplication, false starts, and waste motion that attended the armament program in the early days of War II that vast strides have been made by both the military and industry in working out a smoothly operating transition from civilian to war goods. Admittedly, the pressure of all-out war status is missing, but even if that should come about, there is no doubt that this time both parties will know well in advance where they are going. Each company in the automobile industry knows pretty well by now what it would be required to do. Some behind-the-scenes development work has been going on and there will be more contracts in the automotive industry. However, the way it is working out, it appears quite clear that all present plans call for is a very moderate military program superimposed on a high level of civilian production. Unless world events take a critical turn, that pattern probably will prevail for the next few years, at least.

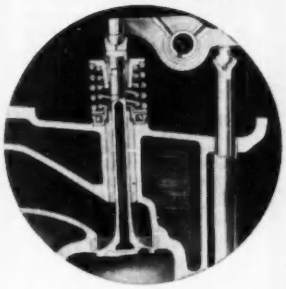
It has just been announced that the Cadillac light tank order amounts to $110 million. Packard also is tooling up for two military commitments from the Navy and Air Force. Nature of the products, which are still in the engineering stage, has not been disclosed.

AUTOMOTIVE INDUSTRIES
Keeps You Informed

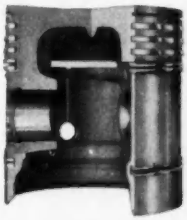
A CAPITAL "T" for TRANSPORTATION



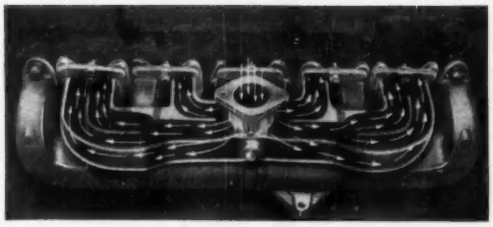
.... The T-6427



NEW, LARGER, SODIUM-COOLED EXHAUST VALVES WITH POSITIVE ROTARY ACTION prevent accumulation of carbon, and resultant power loss and damage to valve lips, seats, and springs.



CHROMIUM-PLATED TOP PISTON RING, located at maximum distance below top of piston, makes for high oil economy, and long life for cylinder bores and rings.



PATENTED INDIVIDUAL PORTING—This exclusive system, developed by Continental engineers, assures uniform distribution of fuel mixture to all cylinders, eliminates "loading," greatly improves thermal efficiency, and makes directional influences of carburetor and air cleaner much less critical.

Product of Engineering Know-How That Dates From 1902

It's Number One choice for those long, tough hauls—a capital transportation engine—this 1950 Red Seal T-6427. Latest in a long line bearing the same designation, it embodies features "engineeringly" balanced to achieve the performance characteristics required of modern transportation. More power, to maintain higher road speeds and minimize shifting on grades. Higher compression, for maximum power from modern fuels. Flexibility, for maneuvering in traffic. Smoother running, for economy, driver comfort, and longer engine life. For "tops" in ALL the factors that combine to cut ton-mile costs, it will pay you to investigate this latest, greatest "T", product of engineering know-how that dates from 1902. Write for bulletins and free information.

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Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE INDUSTRIES.

General business activity in mid-August continued at a level substantially above that a year ago. Increases during this period were reported in department store sales, bituminous coal production, and construction, while railway freight loadings, electric power production, and crude oil output declined moderately. For the week ended Aug. 19 the *New York Times* index of activity stands at the all-time high of 165.9, as compared with 164.8 in the preceding week and 143.2 a year ago.

The dollar value of department store sales in the week ended Aug. 26, as reported by the Federal Reserve Board, was equal to 288 per cent of the 1935-39 average, as compared with 281 in the week before. At this level, the value of sales was 15 per cent more than in the comparable week of last year. The total reported since the beginning of the year was four per cent more than the corresponding sum in 1949.

Production of bituminous coal and lignite for the week ended Aug. 19 is estimated at 11,235,000 net tons, 360,000 more than the output in the week before and 3,711,000 above the comparable amount last year.

Civil engineering construction volume reported for the five-day week ended Aug. 31, according to *Engineering News-Record*, was $342 million, a figure exceeded only twice before this year and 50 per cent more than the weekly average to date for 1950. The total recorded since the beginning of the year, at $8 billion, is 46 per cent more than that in the similar period of 1949.

Railway freight loadings during the week ended Aug. 26 totaled 836,744 cars, 1.7 per cent less than the figure for the week before but 12.0 per cent more than the comparable number recorded a year ago.

Electric power production declined slightly during the same period. At 6346 million kilowatt-hours, total output was 14.9 per cent above the amount a year earlier, as compared with an advance of 14.2 per cent shown in the preceding week.

Crude oil output in the week ended Aug. 27 averaged 5,699,480 barrels daily, 8100 less than in the preceding week, but 930,380 above the production in the comparable period of 1949.

The wholesale price index of the Bureau of Labor Statistics during the week ended Aug. 22, at 166.1 per cent of the 1926 average, was 0.7 per cent higher than in the preceding week and 8.8 per cent above the corresponding figure in 1949.

Member-bank reserve balances declined $157 million during the week ended Aug. 30. Underlying changes thus reflected include increases of $96 million in Reserve-bank credit, $79 million in money in circulation, $114 million in Treasury deposits with Reserve banks, and $12 million in nonmember deposits and other Federal Reserve accounts. A decrease of $51 million in the monetary gold stock was also reported.

Total loans and investments of reporting member banks advanced $60 million during the week ended Aug. 23. An increase of $153 million in commercial, industrial, and agricultural loans was recorded. Total business loans, at $14,512 million, were $1570 million more than the comparable sum a year ago.

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LOCK WASHERS
TO MEET
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Garrett, as a manufacturer, offers you one source and quick deliveries on all types of small parts—flat washers, spring lock washers, stampings, springs, hose clamps, snap and retainer rings. Write for new folder of specifications for Armed Forces washers.

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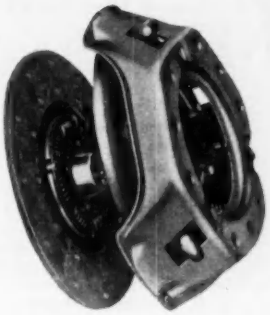
B-W ENGINEERING PRODUCTION

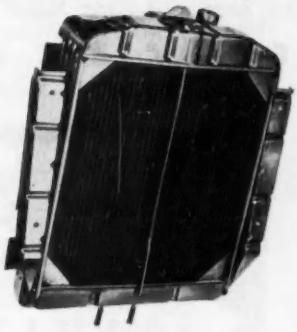
LONG clutches



Long clutch reputation has been built on quality and dependability . . . sound engineering and specialized manufacturing techniques. Since 1922, the leading makes of cars, trucks, buses and tractors have been equipped with Long clutches. They are available in a wide range of sizes and torque capacities.

LONG radiators

Whether your radiator application is standard or special, Long engineers will gladly assist you in balancing the system for maximum heat exchange benefits. Long engineering experience spans millions of automotive radiator units installed as original equipment.



LONG torque convertors

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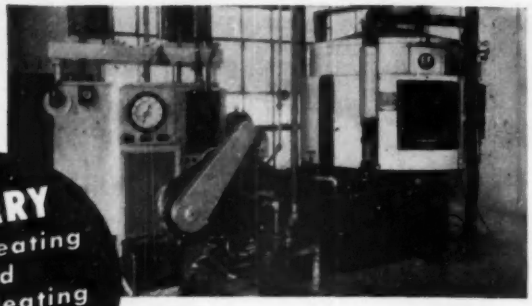
BORG-WARNER CORPORATION
DETROIT 12, and WINDSOR, ONTARIO



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MEN *in the* NEWS

(*Continued from page* 25)

search Laboratories. **E. H. Lamberger** has been appointed assistant to the manager of the Patent Dept.

Aluminum Company of America—**Alfred M. Hunt** has been made asst. secretary.

National Motor Bearing Co., Inc.—**Karl A. Panitz** has been named Chief Engineer.

Jessop Steel Co.—**John R. Harbaugh** has been appointed Asst. General Manager of Sales.

Simmonds Aerocessories, Inc.—**Baird Hodgkinson** has been appointed Ignition Sales Engineer.

Eaton Mfg. Co.—**Charles A. Kiefer** has joined the company as ustomer contact manager.

Mack Trucks, Inc. — Announcement has been made of the appointment of **Lester E. Reeve** as special assistant to **E. D. Bransome**, Chairman and President of the company.

Bla·k & Decker Mfg. Co.—**Thomas I. Burbage** has been elected Secretary to succeed **Harry G. Wheel**, deceased.

Walker-Turner Div., Kearney & Trecker Corp.—Announcement of the appointment of **Lawrence H. Russell** to the position of Sales Manager has been made.

Brad Foote Gear Works—**Gunner E. Gunderson** has been named President. **E. J. Lindgren** was elected Vice-President, and **H. J. Buescher**, Secretary-Treasurer.

Towmotor Corp.—**Harold E. Boehm** has been elected Controller.

Ammco Tools, Inc.—**William Steinwedell** has been appointed Vice-President in charge of production.

Parker Rust Proof Co.—**Van M. Darsey** has been made Vice-Chairman of the Board; **Robert W. Englehart** is President; **F. J. DeWitt, Jr.**, General Sales Manager, has been appointed Vice-President in Charge of Sales.

Publications Available

(*Continued from page* 54)

company's Spun End Process has been released. The 28-page, 2-color booklet contains many photographs and diagrams showing comparisons between the spun end process and other methods of fabricating similar products.

L-72—Adhesives and Sealers

Minnesota Mining and Manufacturing Co.—An illustrated application manual on the use of adhesives and sealers in

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IT GOES WITHOUT SAYING

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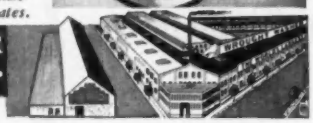
Large volume production, the most advanced methods and facilities, plus more than 60 years of continuous experience in the manufacture of Washers, are factors that enable us to offer you top quality washers and stampings at competitive costs. Over 22,000 sets of dies for making Washers of every type (Standard and Special), from every type of material, for every purpose, in any finish. STAMPINGS of all descriptions; Blanking, Forming, Drawing. *Submit your blueprints and quantity requirements for estimates.*



WROUGHT WASHER MANUFACTURING CO.

The World's Largest Producer of Washers

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autobody refinish shops has been announced. The 16-page manual gives application methods and technical data on "3M" adhesives, sealers and coatings.

L-73 Dry Cyaniding Process

Surface Combustion Corp.—To present latest developments in the modern dry (gas(cyaniding process, the company has issued a new bulletin giving the latest equipment and its applications for this field. Engineering applications of the dry cyaniding process to various products are described in detail.

L-74 Forging

The Steel Improvement & Forge Co. —A 44-page informative catalog on shaping and improving metals by forging is available. It shows pictures of methods used, including designing, die sinking, drop forging, heat treating and inspection for quality control. Included also are tables of the characteristics and applications of commercial forging metals and standard tolerances for drop forgings.

L-75 Heat Treating Ovens

Young Brothers Company—A new 12-page folder describes the company's complete line of heat treating ovens. Examples of standard and special designs are illustrated.

(*Turn to page* 134, *please*)

that trim, well-groomed look —

In the dealer's showroom a searching glance tells her . . . either the car has it, or hasn't—that well-groomed look of quality trim materials in gracious harmony with the whole interior ensemble.

Col-O-Vin is a versatile plastic coated fabric that adds refinement and individuality to car interiors. It is supplied in volume to motor car and seat cover manufacturers. Let us show you how our design-and-color stylists can adapt Col-O-Vin to your special requirements.

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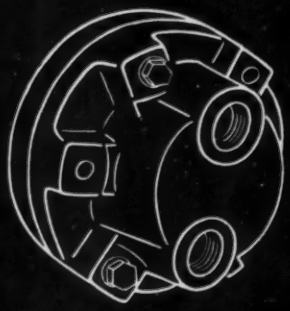

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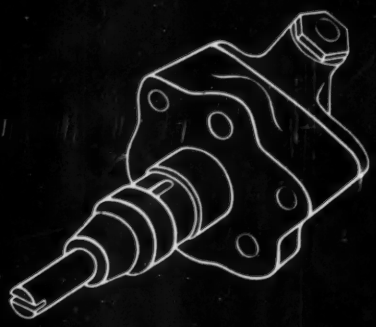
Low Heating



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The first cost of a fastener is low when compared to the cost of your product.

But—first cost of an inferior fastener isn't final cost in terms of assembly time.

A cheap fastener may cost more than you can afford. That's why it pays to buy good fasteners.

Scovill Makes Good Fasteners

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Industrial Fastener Sales, Waterville Division
Scovill Manufacturing Co., Waterville 14, Conn.

Montclair, N. J. • Detroit • Wheaton, Ill.
Los Angeles • Cleveland • San Francisco

Publications Available

(*Continued from page* 132)

L-76 Dynamatic Couplings

Dynamatic Corp.—An attractive 2-color catalog describes and illustrates water-cooled couplings for adjustable-speed drives. Text includes basic principles of Eddy-current couplings, characteristics of the Dynamatic adjustable-speed coupling, application of water-cooled couplings, operating principles, construction details, etc. Typical application photographs are given, and Torque capacity curves and dissipation capacity in hp for each coupling is shown in an application data table.

Occupations Available

PROFESSIONAL AND RELATED OCCUPATIONS

Architect, Marine; Chemist—includes analytical, biological, organic, physical, inorganic, pharmacognosist, pharmacologist; Engineer—includes chemical—includes only chemical, ceramic; civil, electrical, industrial, mechanical, mining, petroleum, sanitary; Chief, marine; Geologist—includes geologist and geophysicist; Shipmaster; Metallurgist—includes, extractive, physical; Tool and Die Designer—includes only die designer, tool designer.

SKILLED OCCUPATIONS

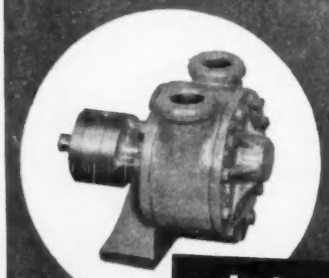
Aircraft and Engine Mechanic—Includes only aircraft mechanic, aircraft-engine mechanic; airplane mechanic; Apprentice (critical occupations only) Boilermaker—includes boilermaker, lay-out man, fit-up man, boilershop mechanic; Boilermaker, marine; Bricklayer, refractory; Coremaker; Driller, petroleum—Includes cable driller, Rotary driller; Die Setter; Electrician, airplane; Foremen (critical occupations only); Glass Blower, laboratory apparatus; Instrument Repairman—includes only instrument repairman, aircraft instrument man, electrical instrument repairman; Lay-out man, Marine; Loftsman—includes only loftsman, marine, mock-up assembler, loftsman, aircraft, boilermaker-loftsman; Machinist—includes machinist, bench machinist, instrument maker, laboratory mechanic, lay-out man, marine machinist, job setter; Maintenance mechanic; Millwright; Model maker; Molder—includes only bench molder, finish molder, floor molder, pattern molder; Patternmaker; Precision Lens Grinder—includes only lens grinder, lens polisher; Roller, iron and steel; Ship Rigger; Stillman, Petroleum processing; Tool and Die maker—includes only die maker, tool maker, tool & die maker.

BOOKS...

DIAMOND TOOL PATENTS, TRUING OF GRINDING WHEELS, by *W. Jacobsohn*, published by *Industrial Distributors (Sales), Ltd.*, 32-34 Holborn Viaduct, London E. C. 1, England. This is a supplement to a survey issued about a year ago containing abstracts of relevant patents in Great Britain, Germany, and the United States, issued from 1916 to the end of 1946. The present booklet considers patents issued during 1947 and 1948, and it supplements the material presented previously.

AUTOMOTIVE INDUSTRIES Goes into Leading Plants in the Automotive and Aircraft Industries

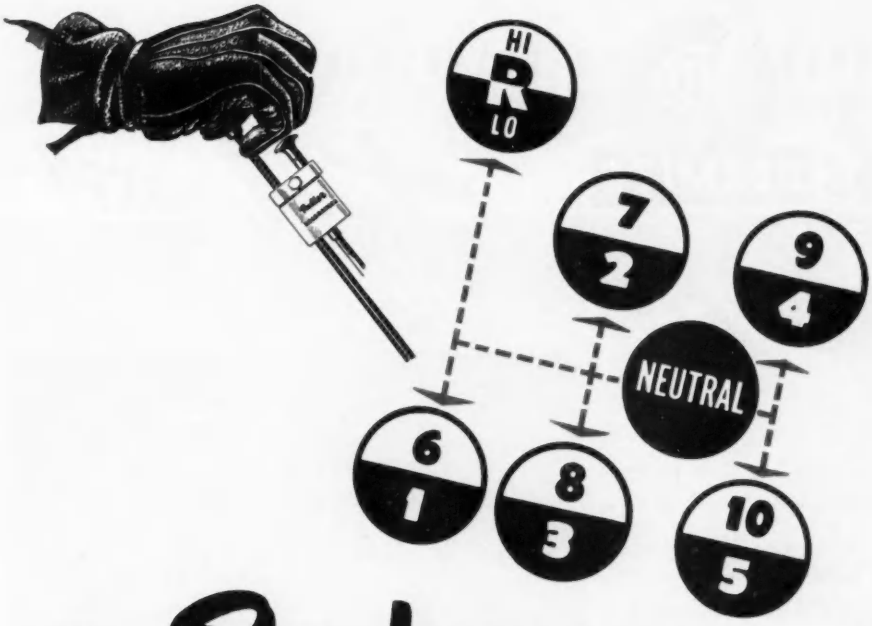
SPECIFY THIS COMPACT TUTHILL PUMP



For Dependable High Pressure Service

This Tuthill Model C K pump is designed to save space, material and money in high pressure service on machine tools, engines and hydraulic devices. Available in capacities up to 50 g.p.m. and pressures up to 400 p.s.i. Direct motor drive, V-belt units and integral drives. Write for Model C K bulletin.

TUTHILL PUMP COMPANY
939 E. 95th Street, Chicago 19, Ill., Phone REgent 4-7420



the Roadranger

One lever controls *10* speeds without GEAR-SPLITTING

With the *new* Fuller Roadranger Transmission, you shift 1-2-3-4-5 . . .
Then, you push or pull the *range selector button*, shift through neutral and . . .
Go right back through the series for 6-7-8-9-10.
Yes, 10 speeds forward with *no gear-splitting*. Straight shifts all the way.

Think what this entirely new theory in transmissions can do for you, this two-range Roadranger where the 10 selective ratios are so evenly and progressively spaced that all shifts are only 28% steps!

First, ⅓ fewer shifts. Second, shifts are easier and quicker. Third, there is no waiting—the engine always operates at peak rpm.

That's why this new transmission helps save fuel . . . eliminates lugging after shifts . . . maintains higher average speeds.

If you have always taken a transmission for granted, write today for all the facts on the Roadranger and see how this new transmission can mean greater efficiency for the rigs you design and build.

where horsepower goes to work

FULLER MANUFACTURING COMPANY (Transmission Division), KALAMAZOO 13F, MICHIGAN

Unit Drop Forge Division, Milwaukee 1, Wis. • WESTERN DISTRICT OFFICE (SALES & SERVICE—BOTH DIVISIONS), 1060 E. 11th Street, Oakland 6, Calif.

DESIGNED TO OUTPERFORM THEM ALL!

The PERMITE "Permatrol" PISTON

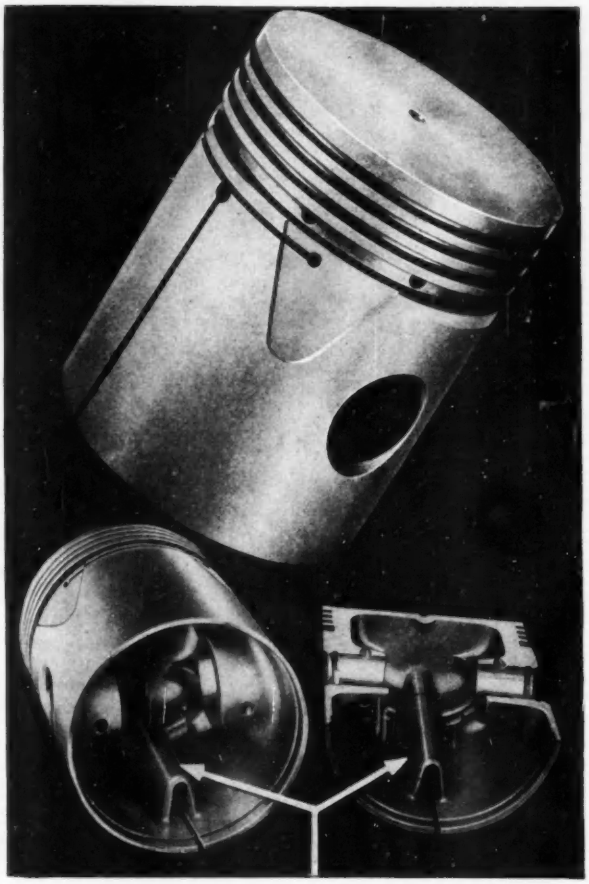
PERMITE'S ALUMINUM ALLOY PISTON WITH V-BRIDGE STRUCTURE . . .

- ★ **PROVIDES UNIFORM SKIRT EXPANSION AND CONTRACTION**
- ★ **IMPARTS STRENGTH AND STABILITY TO THE PISTON — PREVENTS SKIRT COLLAPSE**
- ★ **MAINTAINS CONSTANT MINIMUM CLEARANCE FOR FULL POWER PERFORMANCE**

THE Permite "Permatrol" Piston combines *all* the advantages of *both* solid and split skirt piston construction!

It is designed with a "V" structure, cast integral with the skirt, that bridges the vertical slot cut in the minor thrust face. This "V-Bridge" controls expansion and contraction under all operating conditions, without danger of skirt collapse. It eliminates high pressure areas and makes possible almost perfect bearing contact of the skirt. It allows slot construction without "high spotting" and "skirt flexing" and permits the piston to operate with *minimum clearance,* whether the engine is hot or cold.

Cast by the Permite permanent mold process, the "Permatrol" Piston is unsurpassed in design and quality of material and construction. Investigate this outstanding piston design for your engines. Our engineering and consulting staffs will gladly supply complete data on request.



● *"V-Bridge" structure of the "Permatrol" Piston provides permanent control of skirt expansion and contraction.*

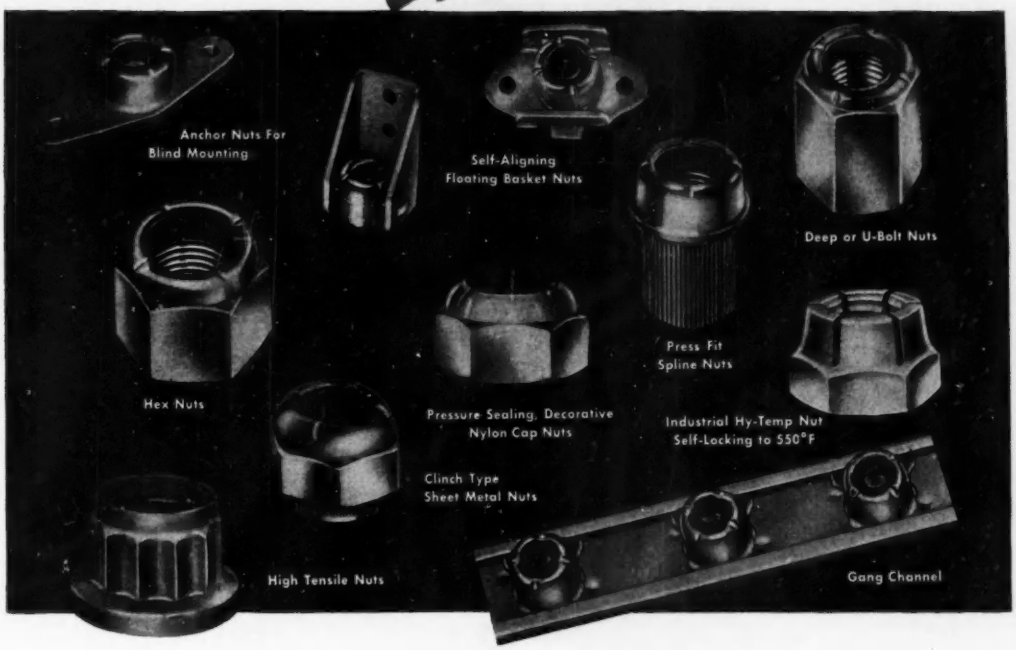
ALUMINUM INDUSTRIES, INC.

CINCINNATI 25, OHIO

[illegible] ATLANTA, [illegible]

ALUMINUM PERMANENT MOLD, SAND and DIE CASTINGS...HARDENED, GROUND and FORGED STEEL PARTS

ESNA *Self-Locking* FASTENERS


Anchor Nuts For Blind Mounting
Self-Aligning Floating Basket Nuts
Deep or U-Bolt Nuts
Hex Nuts
Press Fit Spline Nuts
Pressure Sealing, Decorative Nylon Cap Nuts
Industrial Hy-Temp Nut Self-Locking to 550°F
Clinch Type Sheet Metal Nuts
High Tensile Nuts
Gang Channel

3011 ways to solve your Fastening Problems

When fastening problems come up, are you ready with an immediate answer? Or, do you find that many of your problems are major design jobs?

If fastening presents any problem at all, Elastic Stop Nuts can supply the answer fast. In stock, ready for delivery to you when you say the word, ESNA has 453 off-the-shelf answers to your problems. Tooled for production, ESNA has 2558 more.

Yes, 3011 types and sizes of Elastic Stop Nuts cover just about every fastening job you run into. And the self-locking action of the Red Elastic Collar is your guarantee of performance. For instance, when you want to pre-stress a bolt to assure proper load distribution; or if you must "set" and maintain an exact spring-loaded adjustment; the torque provided by the grip of the Red Elastic Collar on bolt threads, will do the job. When you've got to have a fastener with a locking hold that can't be shaken loose by the toughest mechanical or operating vibration, the answer is an Elastic Stop Nut. If you need a fastener that will protect internal bolt threads against corrosion and assure easier repair jobs . . . the moisture seal and guarantee of reusability provided by the Red Elastic Collar means that your fastener is an Elastic Stop Nut.

Problems like yours are solved at ESNA day after day—and have been since 1927. In the railroad industry, in the oil fields, in automobiles, aircraft, and construction projects, reusable, precision-setting Elastic Stop Nuts are doing the kind of fastening job you're looking for.

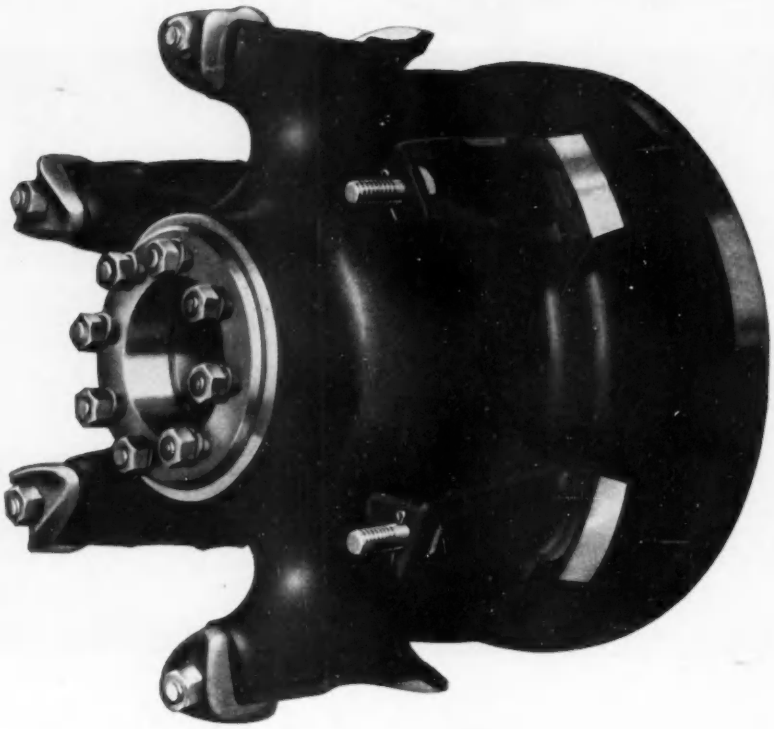
If your problem is a common one, ESNA will supply one of the 3011 types of Elastic Stop Nuts immediately. If you need a special design, ESNA will make quick work of your problem by handling both design and manufacture. Why not get ready to handle that next fastening problem now? Send details of your problem, or write asking for a call from an ESNA engineer. For the new ESNA catalog, write Elastic Stop Nut Corporation of America, Union, N. J.

ESNA

ELASTIC STOP NUTS

HIGH TENSILE · ANCHOR · HIGH TEMPERATURE · SPLINE · CLINCH · GANG CHANNEL · NYLON CAP

GUNITE CAST WHEELS



for highway trucks and trailers

Assure yourself of minimum wheel and tire assembly time by using GUNITE Wheel Assemblies. Tire mounting requires no special tools . . . is quick, easy and simple. Six floating lug bolts firmly lock dual tires on the wheel. The stronger, lighter tubular-spoke of GUNITE design brings you a more efficient wheel with the proven strength of cast electric-steel. Write for complete information on GUNITE Wheels.

FERROUS CASTINGS FOR THE AUTOMOTIVE INDUSTRY

AUTOMOTIVE CASTINGS MADE TO YOUR SPECIFICATIONS.

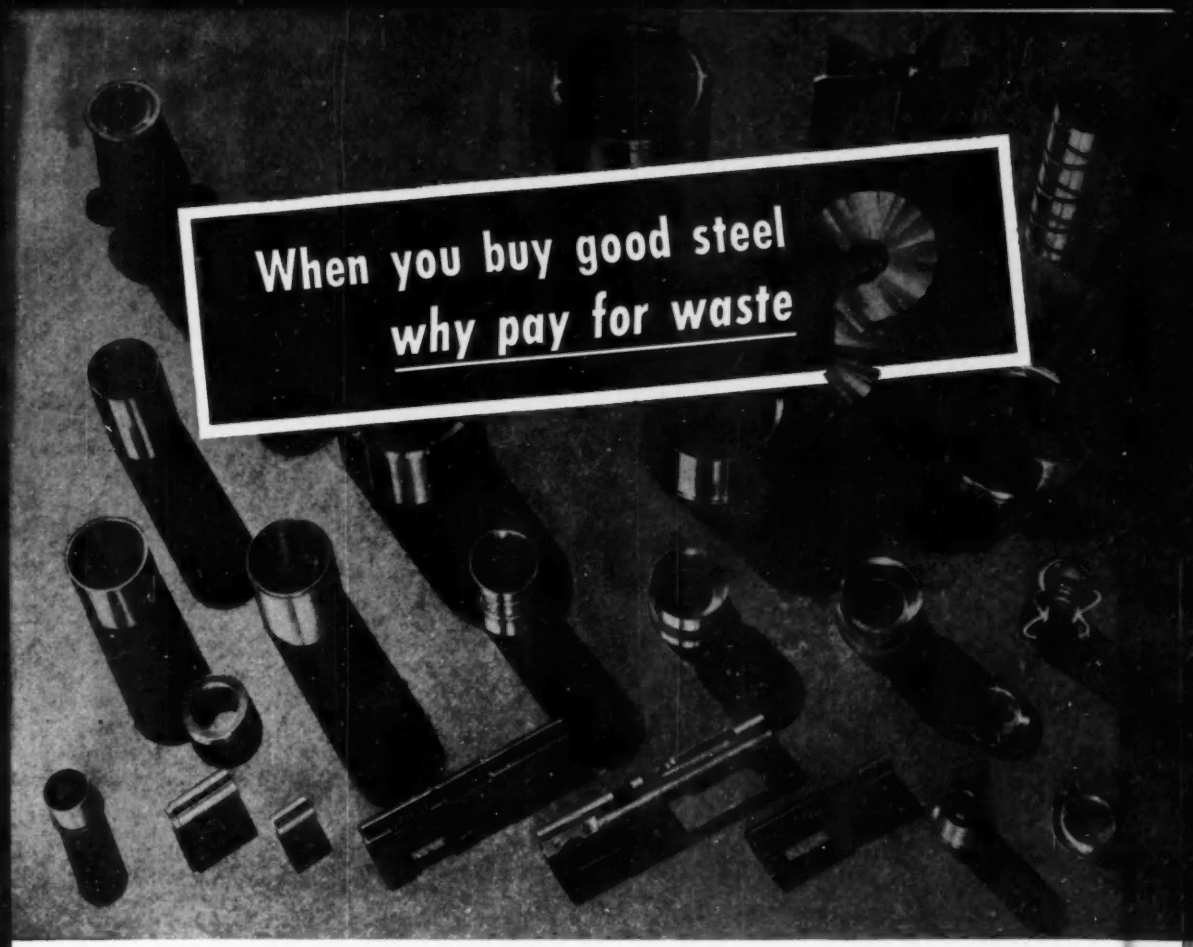
GUNITE operates three ferrous foundries under one roof:

1. Gunite (Processed Gray Iron).
2. Malleable Iron.
3. Electric Steel.

Thus GUNITE can provide the best cast ferrous material to suit your requirements.

GUNITE FOUNDRIES CORPORATION

ESTABLISHED IN 1854 • *ROCKFORD, ILLINOIS*



TIGHTENING the belt on production costs? Then be sure that you don't have too much of your good steel stock lying on the floor as scrap. It's wasteful, expensive and usually unnecessary.

You can save money, time and steel when you use SHELBY Seamless Steel Tubing for hollow cylindrical parts. With tubing, less cutting or boring is required than with solid bars . . . tools last longer. And, since *the basic shape is already made*, fewer operations are required. Rejects go down. Time is saved.

For some good examples of how other parts manufacturers have simplified their production cost problems, take a careful look at the products on this page. Despite the complexity of some, each of them was made from SHELBY Seamless Steel Tubing. In some cases, manufacturing costs are *50%* less than identical products machined from solid bar stock.

Our service engineers will be glad to help you utilize the many advantages of seamless steel tubing for *your* product. Get in touch with us today, draw upon the priceless experience of National Tube Company—world's largest manufacturer of tubular steel products.

FREE BOOKLET

Tells you how to cut production time, production costs, and make better parts in the bargain. Write to National Tube Company, Frick Building, Pittsburgh 19, Pennsylvania.

NATIONAL TUBE COMPANY, PITTSBURGH, PA

(TUBING SPECIALTIES DIVISION)

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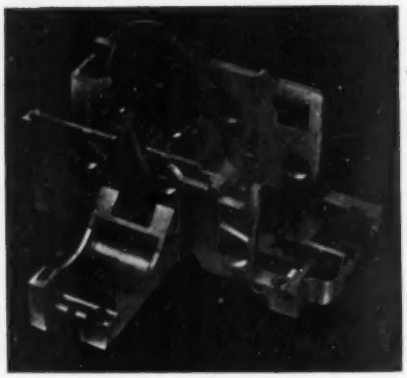
Shelby Seamless Steel Tubing

UNITED STATES STEEL

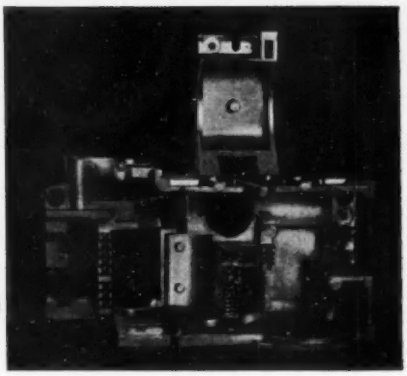
MAGNESIUM DIE CASTINGS

"They're priced competitively"

Magnesium die castings can improve your product! And you don't have to pay a premium to get the advantages offered by magnesium. In most cases *Dow magnesium die castings are competitive with those in other metals* and in some cases they are cheaper. Use this established die casting material for your product. A wide range of applications in many different fields has proved magnesium die castings sound and economical.



hold slots to ±0.001" with no taper?



Dow can do it in Magnesium!

Design requirements for this teletype bracket frame were tough. To eliminate some costly machining operations, it was desired to cast the numerous slots without taper and to hold tolerances in the slots to ±0.001". In addition, all holes in the casting were to be produced by coring. As cast in magnesium, the brackets met these stiff requirements.

Magnesium alloys don't solder to the die. This makes it possible to cast small cored holes and slots without taper. Dimensional accuracy can be maintained at a high level because magnesium alloys don't "creep" or "grow". Magnesium's unequalled machinability makes any required machining fast and economical. And a high strength-weight ratio allows strong, rigid design at minimum weight.

If you have a die casting application, write to Dow. Find out how Dow magnesium die castings can improve your product, cut its cost, make it easier to sell. Use Dow's production facilities for quality die castings at competitive prices.

Write to Dept. MG18

Magnesium Division

THE DOW CHEMICAL COMPANY

MIDLAND, MICHIGAN

New York • Boston • Philadelphia • Washington • Atlanta
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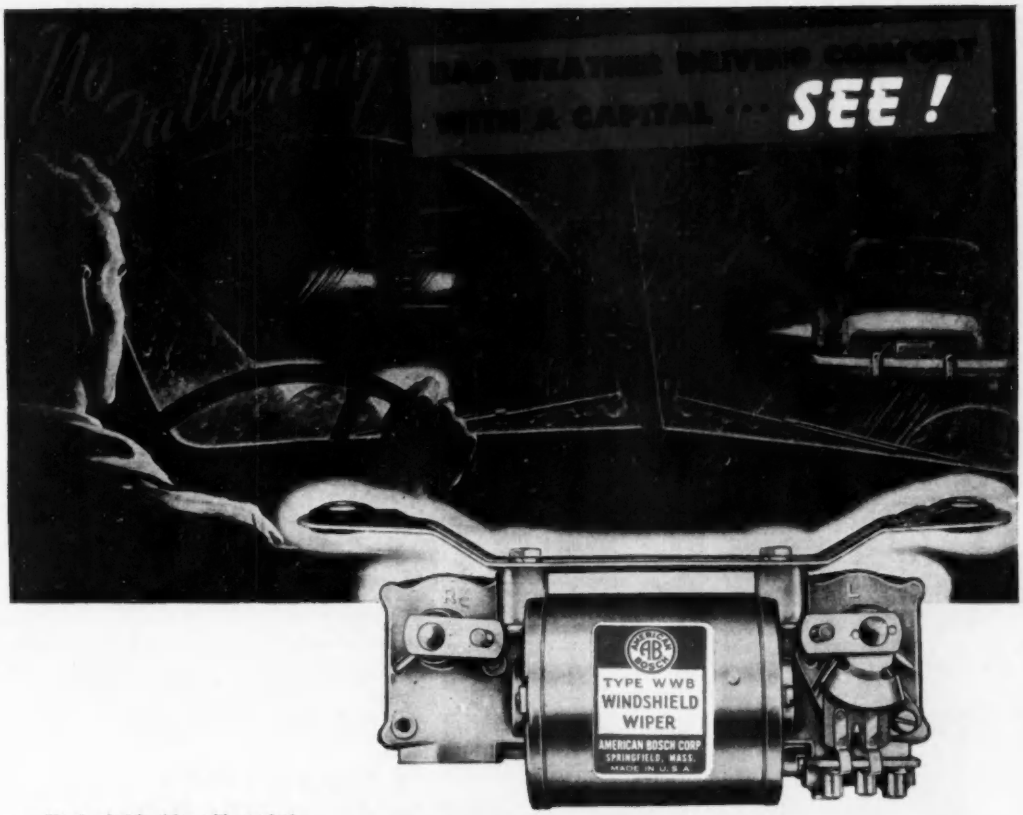

- Direct, electric drive with constant action regardless of engine load or speed.
- Synchronized operation of Dual arms and blades.
- Two speed operation. Tandem or opposed wiping motion.
- Fully automatic blade parking adjustable to suit installation.
- Bad weather power — 30 inch/lbs. torque per blade.
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- For 6, 12 or 24 volt systems.

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DUAL ELECTRIC WIPERS FOR TRUCKS & PASSENGER CARS

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Also available—the famous WWA Single Electric Wiper for Truck, Bus and Marine service.

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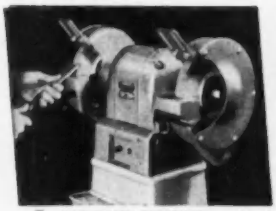
OVER 100 WAYS TO CUT COSTS in Production, Repair, Construction

Black & Decker Tools give you *MORE OUTPUT . . .*

25 **B&D ELECTRIC DRILLS** *are available in capacities from ¼" to 1¼" in steel, double in hardwood. Drive twist drills, wood augers, hole saws.*

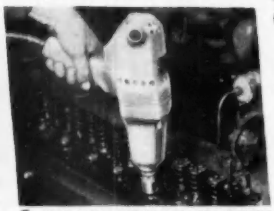
4 **B&D SANDERS** *each give you four uses — sanding, grinding, wire brushing, wood planing. 7" and 9" disc diameters. New 7" Special model is ideal for small shops.*



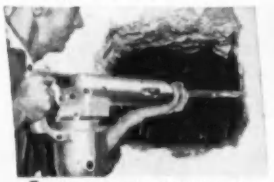
4 **B&D BENCH GRINDERS** *speed tool sharpening, grinding, wire brushing, buffing, etc. 6" to 10" wheel diameters. Adjustable tool rests.*

4 **B&D PORTABLE GRINDERS** *bring the tool to the work for speedy grinding, wire brushing, buffing. 3" to 5" wheel diameters.*

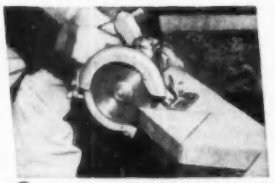
25 **B&D SCREW DRIVERS** *drive anything from delicate screws to nuts and bolts up to 1" diameter. Positive and adjustable clutches, 90° Angle Head models.*



1 **B&D ⅜" ELECTRIC IMPACT WRENCH** *hammers loose the most stubborn, rusted fastening. Drives nuts, bolts, studs tight. ½" square drive shank. No twisting, turning!*



4 **B&D ELECTRIC HAMMERS** *drive star drills, bull points, chisels; for drilling, channeling, demolition, chipping, scaling; in concrete, stone, brick, metal, wood, etc.*



3 **B&D ELECTRIC "QUICK-SAWS"*** *are ten times faster than hand sawing. Rip or crosscut; cut angles, grooves. Models for cutting to max. depths of 2⅜", 2⅝", 3⅛".*

Per MAN B&D Electric Tools are perfectly balanced, weight-saving, easy to control. Help mechanics work faster, with less fatigue; do more accurate work with less "rejects;" to cut your labor costs on any job!

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Per TOOL Black & Decker Tools are built to last, give you extra years of service that cut your tooling costs. Housings are huskier. Parts are extra tough. Quality construction throughout.

For expert help in CUTTING COSTS . . .

Let your nearby B&D Distributor make an experienced survey of your shop to show you where you can save money. Phone him today!

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In addition to the Tools pictured THE WORLD'S MOST COMPLETE LINE includes:

5 Drill Stands • 2 Tappers • 3 Electric Shears
5 Die Grinders • 3 Polishers • 1 Saw Arm
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8 Valve Shops • 3 Valve Seat Grinders
1 Valve & Tool Grinder
. . . and Hundreds of Tool Accessories

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Black & Decker PORTABLE ELECTRIC TOOLS

From your designs we'll furnish a precision replica in bronze, in standard or special alloy, including helical cuts, chamfers, recesses or tapers. We have excellent facilities for producing a wide variety of simple or complex sizes and shapes in any quantity for many applications, including aircraft, marine, tanks and other military equipment. Laboratory control and inspection methods hold rigidly to your specifications. Research and engineering consultation service is available without obligation. Our seven manufacturing plants also produce a complete line of silent sleeve bearings in many combinations of size, design and materials for a multitude of applications.

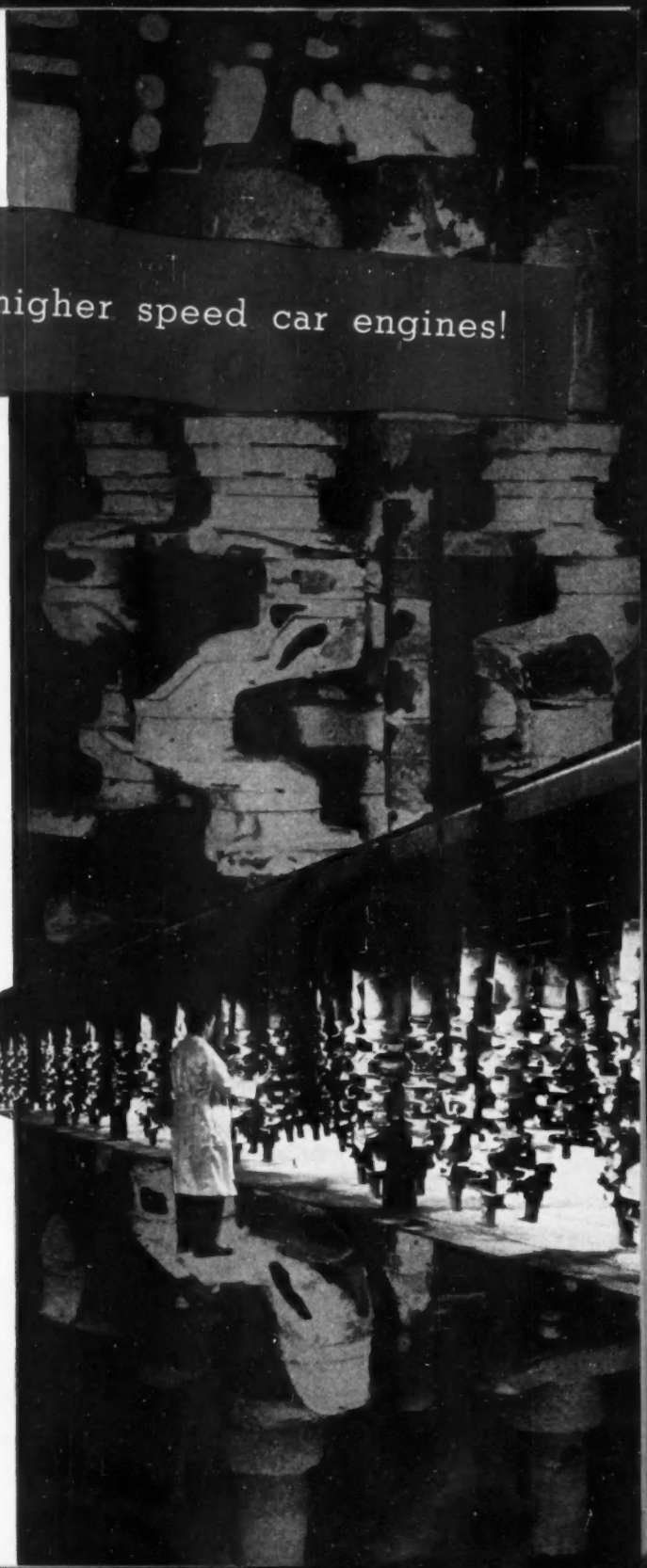
Your inquiry is invited.

FEDERAL-MOGUL CORPORATION, 11037 SHOEMAKER, DETROIT 13, MICH.

FEDERAL-MOGUL

OVER FIFTY YEARS OF CONTINUOUS BEARING EXPERIENCE

"Automotive History
Was Made by Men
Who Dared to Deviate"



—designed for new, higher speed car engines!

AUSCO CAST alloy steel crankshafts

The repeatedly demonstrated structural strength and wear resistance of Ausco Cast Alloy Steel Crankshafts is due in large part to a series of unique Quality Controls, which continue through the entire processing of the product. One of them, illustrated here, is the exclusively devised molding process for the specially-formulated, electric-furnace melted Metal A.S. 80, in which stacks of slab cores are arranged to cast four crankshafts at one time.

More than Two Million Ausco Cast Alloy Steel Crankshafts on motor car engines, attest their Greater Strength, Minimized Bearing Wear, Better Balance, Increase Scope of Design and Saving in Production Cost.

MAY WE SHOW YOU THIS BOOK OF EVIDENCE?

It takes over 100 pages to tell all the advantages of Ausco Cast Alloy Steel Crankshafts for mass produced motor cars. At your invitation, our engineers will be glad to call with this book of evidence, without the slightest obligation on your part.

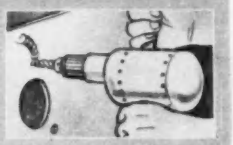
AUTO SPECIALTIES MFG. CO.

Home office, St. Joseph, Michigan

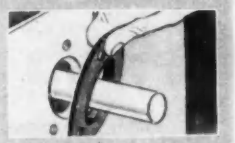
Plants at St. Joseph, Benton Harbor and Hartford, Mich.; Windsor, Ont. Canada

RS269

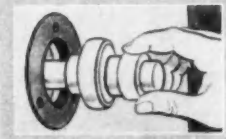
EASY TO INSTALL
NO COSTLY MACHINING



1 Provide holes in machine frame to accommodate flange cup and flange mounting bolts.



2 Slip one bolt of flange, with cup side facing assembler, over shaft.



3 Slide bearing and collar on shaft.

4 Slip other flange over shaft with cup side toward bearing.

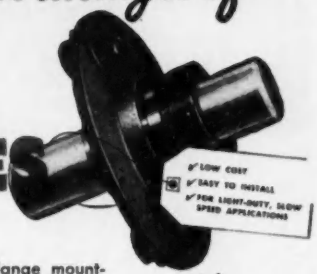
5 Line up bolt holes of flanges with bolt holes on machine, slide bearing into proper position and bolt unit in place. DO NOT TIGHTEN BOLTS.

6 Repeat for other end of shaft and then tighten bolts on both ends.

7 Engage locking collar by turning in direction of shaft rotation until cam in collar drops over cam on lamar ring. Continue turning until cams lock. Tighten set screw.

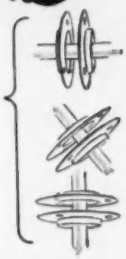
Money-Saving Advantages of

FAFNIR FLANGETTES



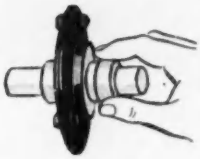
1 Low-cost pressed steel flange mounting. No costly machining.

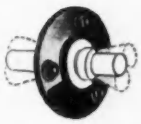
2 Easily mounted in any position . . . vertically, horizontally or at any angle. Needs only 3 or 4 bolt holes to attach.



3 Compact, lightweight. Takes less space than most anti-friction or sleeve bearing mountings.

4 Easy-to-install high quality Fafnir Wide Inner Ring Ball Bearing with Self-Locking Collar which locks the bearing to the shaft with a twist of the wrist. Needs no lock-washers, adapters or other positioning devices. No shaft-shouldering or machining required.





5 Self-aligning in all directions during assembly.

6 Dirt can't get in: grease can't get out. Non-rubbing frictionless Fafnir Mechani-Seals on both sides of bearing.

7 Pre-lubricated, assuring long bearing life and eliminating costly maintenance expense.

8 Ample capacity for radial or thrust loads or for combinations of radial and thrust loads.

9 Adds minimum weight to machine or equipment—resulting in greater economy of operation.

Send for this descriptive folder which describes in detail this complete ball bearing power transmission unit at new low cost. The Fafnir Bearing Company, New Britain, Connecticut.

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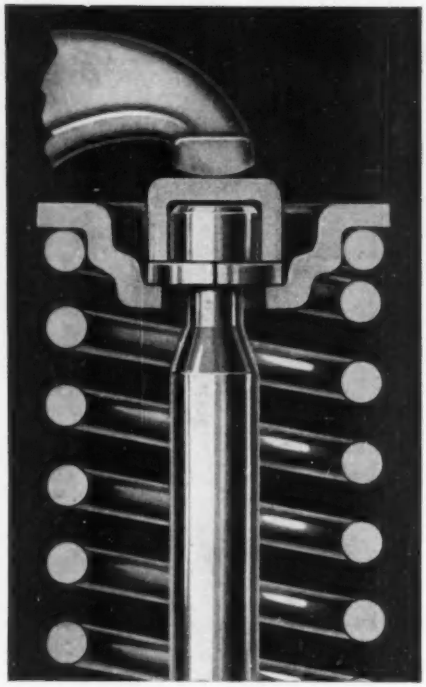
MOST COMPLETE LINE IN AMERICA



EATON Free-Valves

Eliminate the Principal Causes of Valve Failure

—

Maintain Performance at New-Engine Level

—

Lengthen Valve Life

In general, valve failures are traceable to valve stem deposits and uneven seat deposits. When the valve is free, these conditions are largely eliminated. Stem deposits cannot build up; seat deposits are reduced and kept uniform. No one part of the valve head is subjected to excessive temperature for sufficient time to cause failure.

The Eaton Free-Valve is composed of a special spring seat washer, a valve stem cap, a pair of half-circle keys, and a special valve stem shape. During the lift cycle, valve motion is controlled, but not locked so as to prevent movement between the stem and guide. This freedom permits the valve to take variable positions in operation. It has a self-cleaning effect which, in millions of miles of service, has proven its ability to eliminate valve failures between major overhauls and to maintain fuel consumption and power output at approximately new-engine level.

Eaton Free-Valves can be designed into any motor vehicle engine.

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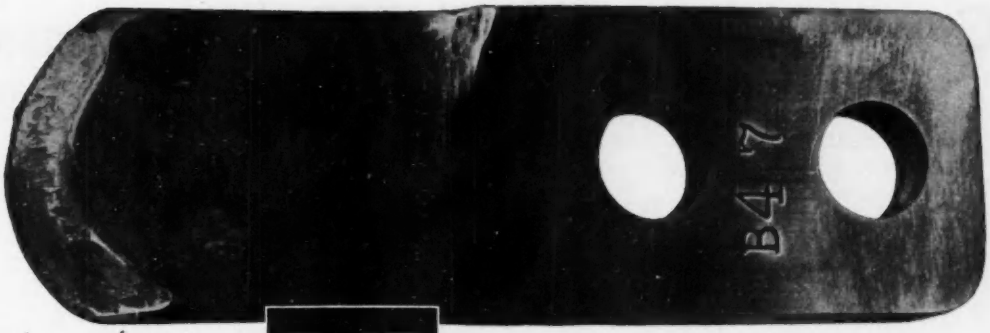

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This die lasted 50% longer!

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SOME TYPICAL EXAMPLES

B-47 dummy blocks, vs. 9% and 12% tungsten types, extruded more than twice as many brass and copper tubes. B-47 dies outperformed 12% tungsten type 1½ to 1.

B-47 punches, vs. low-carbon 18-4-1 type, hot pierced more than twice as many eyes in steel axes. See top picture.

B-47 die inserts, vs. 9% tungsten types, hot pressed more than twice as many steel side gear forgings. B-47 die inserts, vs. regular insert material, performed better than 5 to 1.

B-47 dummy blocks, vs. 5% tungsten-5% chromium types, extruded twice as many copper and brass tubes and rods. B-47 dies outperformed 12% tungsten-12% chromium type.

B-47 punches, vs. 5% chromium type, hot extrusion forged 1½ times as many automotive steel front axle spindles.

B-47 die inserts, vs. 9% tungsten types, extruded 1½ times as many high alloy steel automotive valves. This is considered a very difficult job for any grade of hot work steel.

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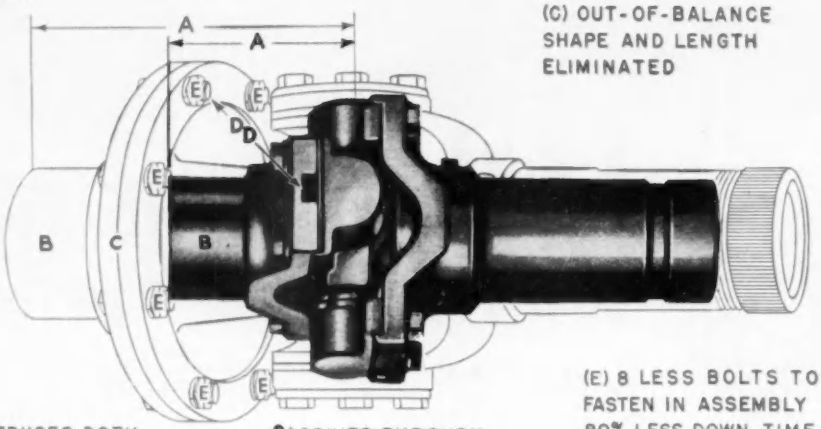

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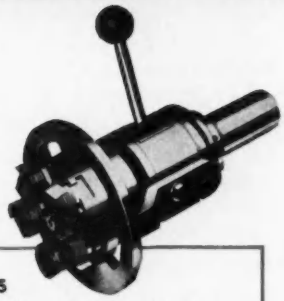

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Part—Adjusting Nut ½" x 4½" O. D.
Material—SAE 1115 Bar Stock.
Machine—Acme-Gridley 5½" RB-4 Spindle Bar Automatic.
Tap—Namco RST, with Ground Circular Chasers.
Thread—3½"—12NF Class 3.
Threading Speed—23 S.F.M.
Pieces Per Chaser Grind—750.
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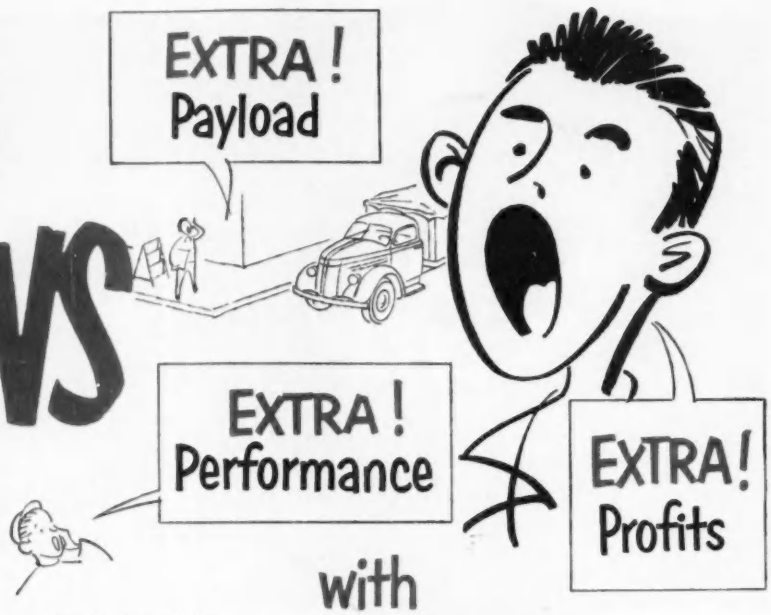

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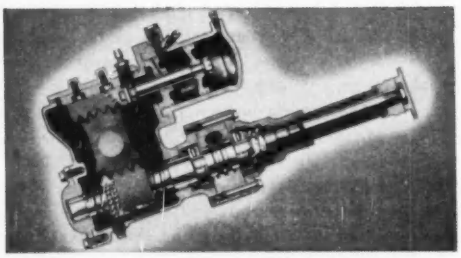

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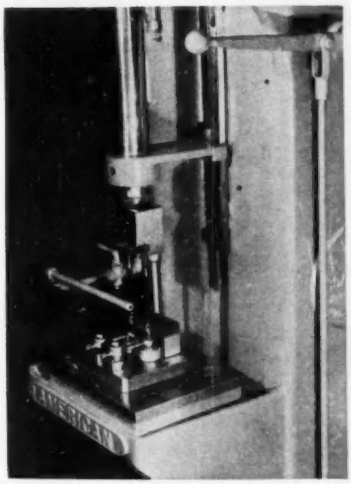

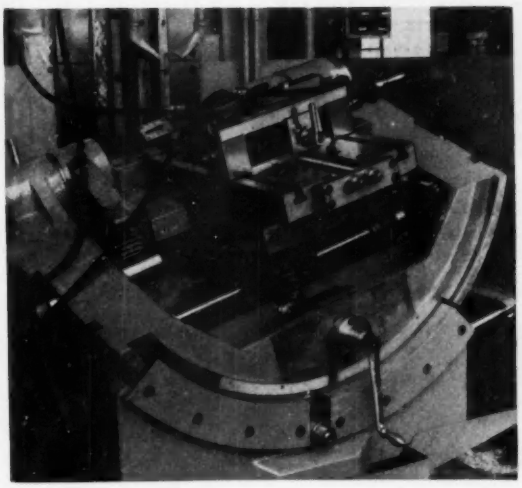

This SIMPLE fixture helped one manufacturer cut costs by adapting an American V-1 two ton press to push down broaching of small motor connecting rods. Parts are located from the large hole and swung easily into position. The broaches are arranged to strip back through the work. A plate above the work prevents parts from lifting. An example of how an American-engineered fixture solved a broaching problem.

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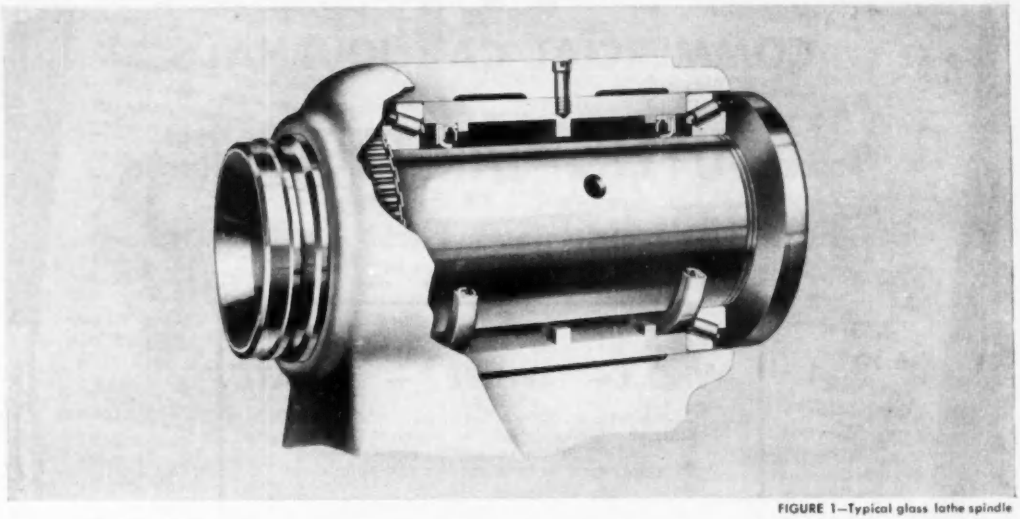

FIGURE 1—Typical glass lathe spindle

Oil Seals Become Air Seals in Spindles of Glass Lathes

The forming of unusual glass shapes such as used in the manufacture of electron vacuum tubes is accomplished with special turning lathes on which both the head stock and tail stock rotate at precisely the same speed. Shapes are formed by heating the glass blank with a group of torches from the outside and by manipulation of hand tools. However, air pressure must be applied to the inside of such tubulations in order to prevent complete collapse of the bulb or other hollow shape.

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A section through a typical glass

FIGURE 2

lathe spindle is shown (Fig. 1). Two National Seals are located just inside each of the large taper bearings. The cavity between these two seals is part of the air passage. Air pressure enters the glass tubulations through the hollow spindle. The leather sealing lip is of the conventional spring tensioned designs. However, no springs are employed, because the air pressure itself provides seal tensioning in direct proportion to the need. Since there is relatively little lubricant used, the leather lip provides ample protection against oil seepage into the air passage. This system has proven completely dependable and efficient in hundreds of these lathes which have been in continuous operation for a number of years

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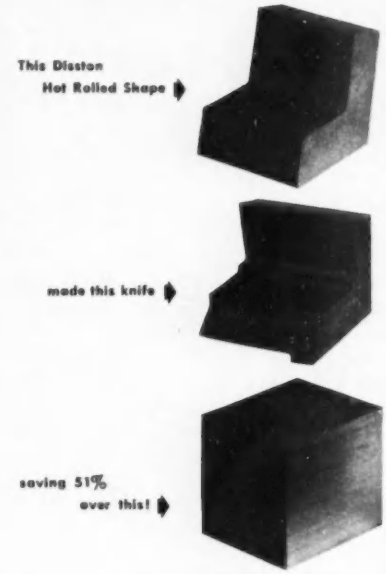

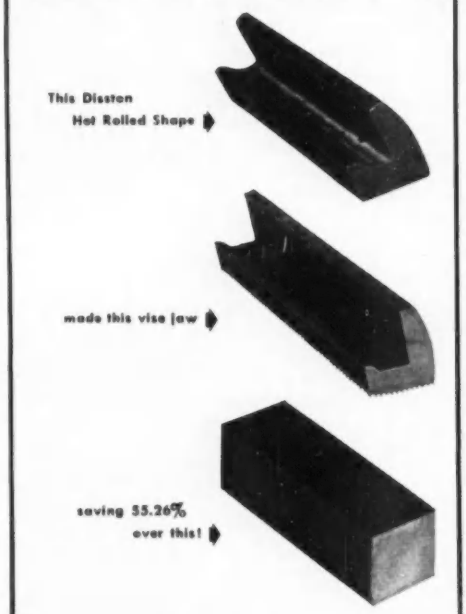

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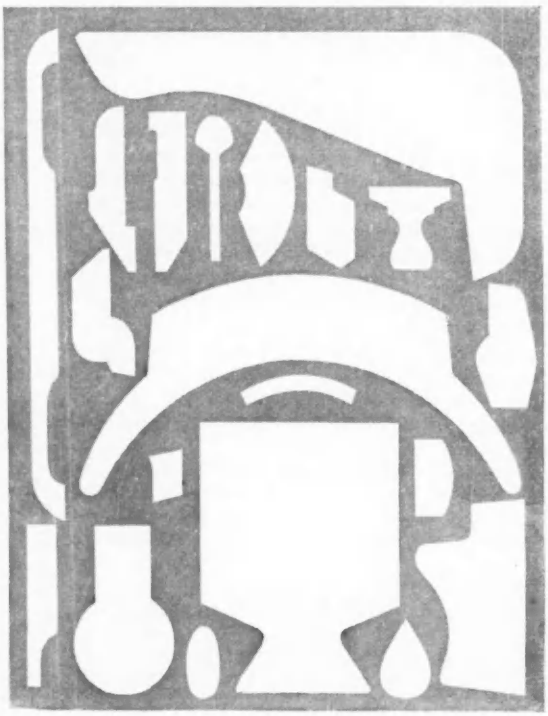

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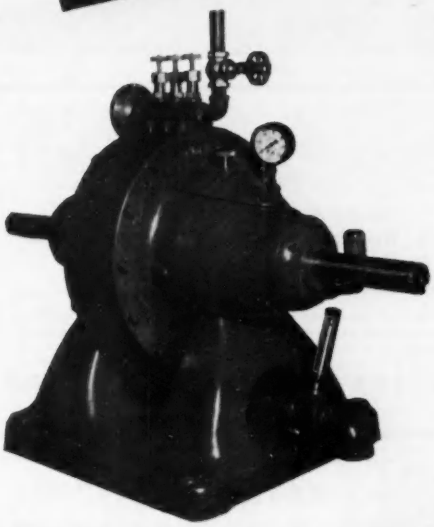

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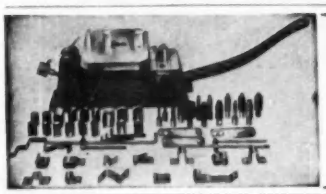

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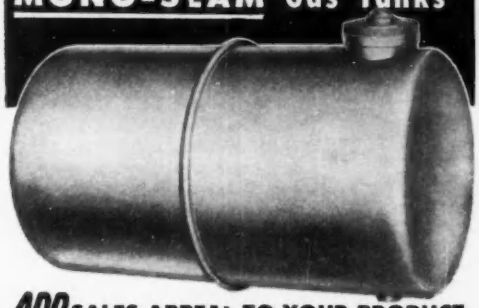

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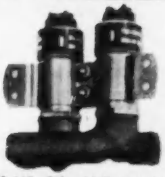

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Acadia Div. Western Felt Works 10
Accurate Spring Mfg. Co. ... —
Acushnet Process Co..... —
Aetna Ball & Roller Bearing Co. ..... —
Ajax Manufacturing Co., The 125
Allegheny Ludlum Steel Corporation 147
Allied Products Corp..... —
Aluminum Co. of Amer..... 123
Aluminum Industries, Inc.... 136
American Bosch Corp..... 141
American Broach & Machine Co. 151
American Chain & Cable Co. 128
American Chemical Paint Co. 85
American-Fort Pitt Spring Div. —
American Screw Co..... —
American Society for Metals 155
American Steel & Wire Co... —
Amgears, Inc. ..... —
Armstrong Cork Co..... 55
Associated Spring Corp..... —
Auto Specialties Mfg. Co.... 144
Automotive Gear Works, Inc. —

Baird Machine Co., The..... —
Barber-Colman Company 27
Barnes Co., Wallace..... —
Barnes Co., W. F., & John... —
Barnes-Gibson-Raymond .... —
Bendix Aviation Corporation
Bendix Products Div..... 14
Eclipse Machine Div..... 73
Stromberg-Elmira Div. .... —
Zenith Carburetor Div. .... —
Bendix Westinghouse Automotive Air Brake Co..... —
Besly and Co., Chas. H..... 5
Bethlehem Steel Co..... —
Black & Decker Mfg. Co., The 142
Blake & Johnson Co., The. ... 62
Blakeslee & Co., G. S..... 92
Borg & Beck Div..... 82
Borg-Warner Corp. ..... —
Bower Roller Bearing Co..... —
Box 53 160
Brandt, Inc., Chas. T..... —
Bridgeport Brass Company . 77
Brown Corp., The..... 100
Builders Steel Supply Co..... 160
Bullard Company ..... —
Bundy Tubing Company..... 6
Bunell Machine & Tool Co... —
Burlington Mills, Inc..... 93

Campbell, Wyant & Cannon Foundry Co. 106
Carboloy Company, Inc..... —
Carnegie-Illinois Steel Corp... —
Centrifugal Foundry Co..... —
Chambersburg Engineering Co. —
Chicago Rawhide Mfg. Co...83-84
Chicago Rivet & Machine Co.. 113
Chicago Screw Co..... —
Cincinnati Milling Machine Co. —
Clark Equipment Co..... —
Clearing Machine Corporation 71
Cleveland Punch & Shear Wks. Co., The 152
Climax Molybdenum Co..... —
Columbia Steel Co..... 139
Columbus Coated Fabrics Corp. 132
Commercial Car Journal..... 154
Cone Automatic Machine Co., Inc. 26
Continental-Diamond Fibre Co. 98-99
Continental Motors Corp..... 127
Continental Tool Works..... —
Cotta Transmission Co..... —
Crane Packing Company..... —
Cross Company, The..... —
Cummins Engine Co., Inc..... —

Danly Machine Specialties, Inc. 79
Davis & Thompson Company 104
Diesel Equipment Div. G. M. Corp..... —
Disston & Sons, Inc., Henry.. 156
Dole Valve Co., The..... 60
Donaldson Co., Inc..... 161
Dow Chemical Company, The 140
Dow Corning Corporation.... 96
Driv-Lok Pin Co..... —
Dunbar Brothers Co., Div.... —
du Pont de Nemours & Co., Inc., E. I..... —
Dykem Co., The..... —
Dynamatic Corp. ..... —

Eaton Manufacturing Co...133-146
Elastic Stop Nut Corp.. 137
Elco Tool & Screw Corp.. 86
Electric Auto-Lite Co., The... 75
Electric Furnace Co., The.... 130
Electric Storage Battery Co.. —
Ex-Cell-O Corp. ..... —

Fafnir Bearing Co..... 145
Fairfield Mfg. Co..... 90
Federal-Mogul Corp. 143
Fellows Gear Shaper Co..... 160
Fitzgerald Mfg. Co., The..... —
Foote-Burt Company, The.... 101
Fram Corp. 87
Fuller Manufacturing Co..... 135

G & O Mfg. Co., The..... —
Galland-Henning Mfg. Co.... 4
Garrett Co., Inc., Geo. K..... 128
General Controls 161
General Electric Company... —
General Radiator Co..... 160
Gibson Co., Wm. D..... —
Globe-Union, Inc. 119
Great American Industries, Inc., Rubatex Div..... 102
Great Lakes Steel Corp..... 11
Greenlee Bros. & Co..... —
Gunite Foundries Corp..... 138

H & P Die & Stamping Co.. . —
Handy & Harman..... —

Index to

The Advertisers' Index is published of the advertising contract. Every rectly. No allowance will be made

Hannifin Corporation 108
Hanson-Whitney Co. ..... —
Harrison Radiator Division... —
Hartford Steel Ball Co..... —
Heald Machine Co., The.2nd Cover
Heli-Coil Corp. 158
Herbrand Division, The Bingham-Herbrand Corp. ..... —
Holley Carburetor Co..... —
Hoof Products Company..... 30
Hoover Ball & Bearing Co.. . 72
Houde Engineering Div..... 157
Houghton & Co., E. F..... —
Howell Electric Motors Co. .. —
Hyatt Bearings Div..... 7

Illinois Tool Works..... 97
Imperial Brass Mfg. Co., The.. 69
Indiana Gear Works..... 120
Inland Manufacturing Div.... —
Inland Steel Company..... 49
International Nickel Co., Inc.. —

Johnson Bronze Co..... 29
Johnson Products, Inc..... 74

Kelsey-Hayes Wheel Co. 115
Kester Solder Company 114
King-Seeley Corp. 107
Kopp Glass, Inc. 94
Kropp Forge Company ..... —

Lamb Electric Company, The 68
Layne & Bowler, Inc. ..... —
Leeds & Northrup Co. 28
Lipe-Rollway Corp. ..... —
Littelfuse, Inc. 76
Long Manufacturing Div. 129
Lord Manufacturing Co. 158

Magnaflux Corp. 105
Magnecord, Inc. 64

Advertisers

as a convenience, and not as part care will be taken to index cor- for errors or failure to insert.

Mahon Co., The R. C. ..... —
Mallory & Co., Inc., P. R. 117
Mattison Machine Works 2
Mechanics Universal Joint Div. 148
Michigan Steel Tube Products Co. 118
Michigan Tool Co. ..... —
Micromatic Hone Corp. ..... —
Midland Steel Products Co. 112
Miller Motor Co. 8
Milsco Manufacturing Co. ..... —
Moraine Products Div. ..... —
Morse Chain Co. 131

N-A-X Alloy Division 11
Nadella ..... —
Nash Bros. Co. ..... —
National Acme Co., The 149
National Broach & Machine Co. 91
National Metal Congress 155
National Motor Bearing Co., Inc. 153
National Steel Corporation 11
National Tube Company 139
New Britain Machine Co. 61
New Departure Div. 24
Niagara Machine & Tool Works 80-81
Norton Company 110-111

Oakite Products, Inc. 159
Ohio Crankshaft Co. ..... —
Ohio Seamless Tube Co., The 89

Page Steel & Wire Div. Amer. Chain & Cable Co. 128
Palnut Company, The ..... —
Parker Rust Proof Co. ..... —
Pedrick Piston Rings ..... —
Perfect Circle Corp. ..... —
Pesco Products Div. Borg-Warner Corp. ..... —
Peters-Dalton, Inc. ..... —
Phoell Mfg. Co. ..... —
Pierce Governor Co., Inc., The 78
Pittsburgh Steel Products Co. —
Potter & Johnston Co. ..... —
Pratt & Whitney Div., Niles-Bement-Pond Company ..... —
Purolator Products, Inc. 121

Ramsey Corporation ..... —
Raybestos-Manhattan, Inc. (Equipment Sales Div.) ..... —
Raymond Mfg. Co. ..... —
Redmond Co., Inc. ..... —
Revere Copper & Brass, Inc. 59
Reynolds Wire Co. 95
Richards Co., J. A. 160
Rinshed-Mason Company ..... —
Rockford Clutch Div. 58
Ross Gear & Tool Co. 9
Rubatex Division, Great American Industries, Inc. 102
Ryerson & Son, Inc., Joseph T. 16

SKF Industries, Inc. ..... —
Saginaw Steering Gear Div. 150
Schmieg Industries, Inc. 67
Schwitzer-Cummins Co. ..... —
Scovill Manufacturing Co. 134
Sealed Power Corporation 57
Seneca Falls Machine Co. ..... —
Service Spring Co. 160
Set Screw & Mfg. Co. 130
Shakeproof, Inc. 97
Shore Instrument & Mfg. Co. 160
Shuler Axle Co. ..... —
Simonds Abrasive Co. ..... —
Spicer Mfg. Div. Dana Corp. ..... —
Sprague Devices, Inc. 88
Stalwart Rubber Co. ..... —
Standard Oil Co. (Ind.) ..... —
StéAme des Roulemants a Aiguilles ..... —
Sterling Aluminum Products, Inc. ..... —
Strom Steel Ball Co. ..... —
Stuart Oil Co., Ltd., D. A. 126
Subscription Post-card 156
Sun Oil Company 63-103
Sundstrand Machine Tool Co. —
Superior Steel Corp. 65
Synchro-Start Products, Inc. 53

Taylor Dynamometer & Machine Co. 159
Tennessee Coal, Iron & R. R. Co. ..... —
Texas Company, The ..... —
Thompson-Bremer & Co., 3rd Cover
Timken Roller Bearing Co., The ..... Back Cover
Tompkins-Johnson Company, The 122
Torrington Co., The 51
Tourek Mfg. Co., J. J. 3
Towmotor Corporation ..... —
Tung-Sol Lamp Works, Inc. 116
Tuthill Pump Co. 134
Tuthill Spring Co. ..... —
Twin Disc Clutch Co. ..... —
Tyer Rubber Co. ..... —

United Specialties Company 70
United States Rubber Co. 12
United States Steel Corp. 139
Universal Products Co. ..... —

Vanadium Corp. of Amer. 109
Vellumoid Co., The 160
Vickers, Inc. ..... —
Victor Manufacturing & Gasket Co. 31

Waldes-Kohinoor, Inc. ..... —
Waukesha Motor Company 1
Wean Equipment Corp. 13
Wellman Bronze & Aluminum Co. ..... —
Western Felt Works 10
Wheland Company, The 161
Wilkening Mfg. Co. ..... —
Williams & Co., J. H. ..... —
Wisconsin Motor Corp. ..... —
Wittek Mfg. Co. ..... —
Worcester Stamped Metal Co. 160
Wrought Washer Mfg. Co. 132
Wyman-Gordon 66

Yates-American Machine Co. 124
Young Radiator Company ..... —

Zollner Machine Works 164

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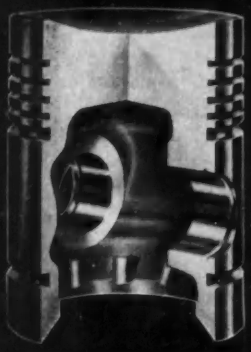

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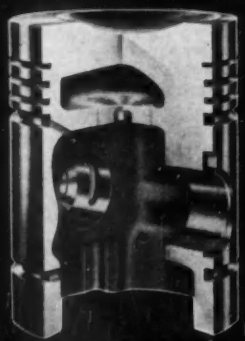

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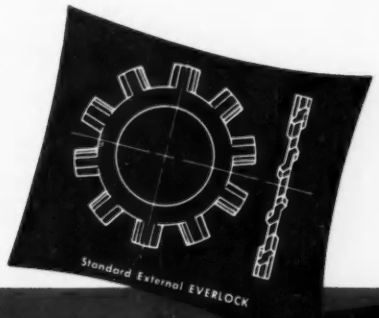

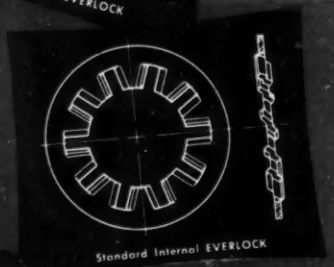

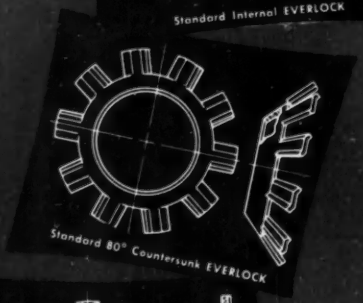

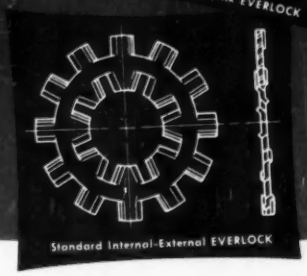

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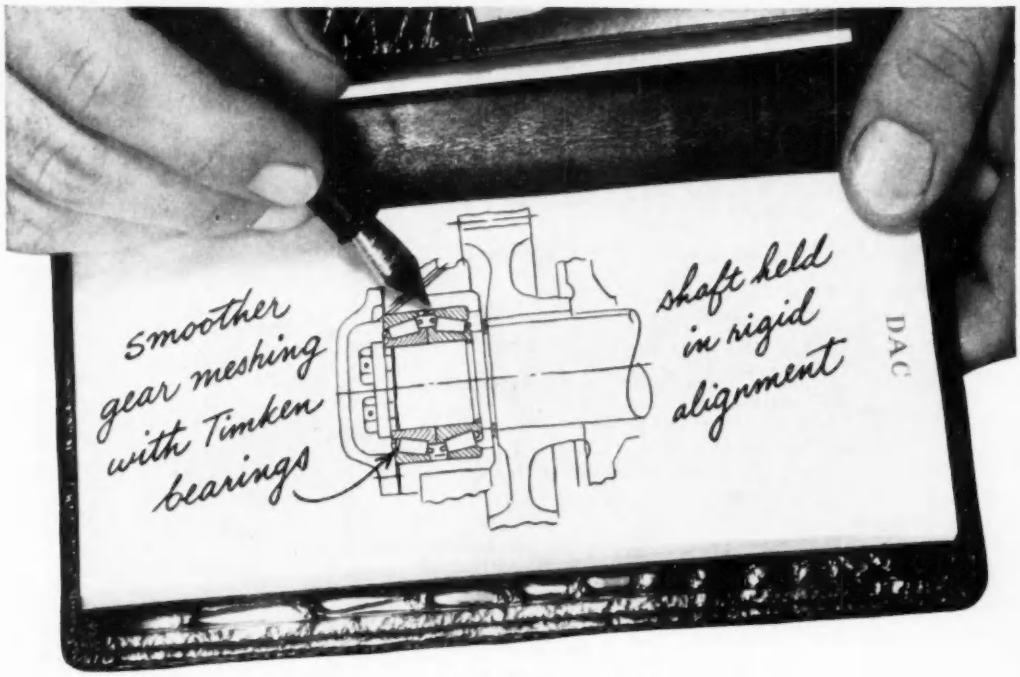

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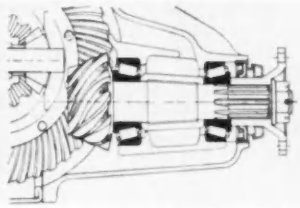

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